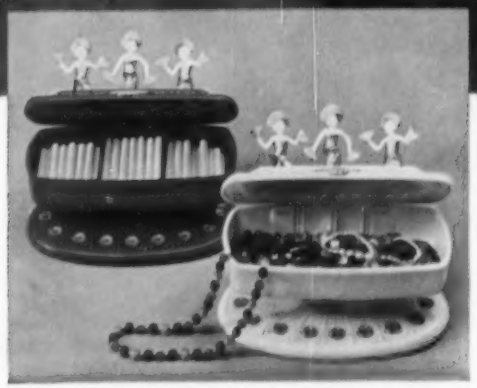
MODERN PLASTICS

OCTOBER 1955



BALI BOX
molded of
Catalin Styrene

Packaging's Spectacular New Center of Attraction

Exotic as a product container, artistic as a reuse facility, appealingly inexpensive . . . Bali Box is Dan Fox's* newest inspiration . . . and most deserving of applause.

Designed to enwrap luxury items like special candies, cigarettes, cosmetics and jewelry, this package will live to thrill and serve its proud possessor long after the original contents will have been enjoyed or removed. The inserts to the left indicate its continuing treasure-chest potentials.

Molded entirely of CATALIN STYRENE in rich cinnabar red, and ivory, Bali Box is truly a precious objet d'art. Its pronounced lotus leaf clusters and centered dragon shield motif are **spiritedly** Balinese and **authentic** as the dancing figurettes that grace the stage.

The tray itself thoughtfully provides adjustable dividers and a felted base-pad. Hand carving, were it to have been directed by Oriental skill and patience, could hardly have bettered the fineness of detail which Bali Box so exquisitely achieves . . . it is a tribute to **the gem of plastics** and to those responsible for its design and manufacture.

**Product of Dan Fox, Inc., an affiliate of Alden Plastic Corp., New York 1, N. Y.*

Catalin **CATALIN CORPORATION OF AMERICA**
ONE PARK AVENUE, NEW YORK, N. Y.

In addition to Styrene Molding Compounds, Catalin chemical products include a wide range of Urea, Phenolic, Crasylic, Resorcinol, Melamine and Styrene Resin formulations

MODERN PLASTICS*

October 1955 • Vol. 33, No. 2

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GENERAL SECTION

PLASTICS ENGINEERING

TECHNICAL SECTION

DEPARTMENTS

Yearly index to Modern Plastics Vol. 32 is available on request.

Modern Plastics, published monthly by Breskin Publications, Inc., at Emmett St., Bristol, Conn. Modern Plastics Encyclopedia Issue published as second issue in September by Plastics Catalogue Corp., at Emmett St., Bristol, Conn. Executive and Editorial Office: 575 Madison Ave., New York 22, N. Y. Entered as second class matter at the Post Office at Bristol, Conn., December 14, 1950, under the Act of March 3, 1879. Subscription rates: U.S., its possessions, and Canada, $6.00 for one year, $11.00 for two years, $15.00 for three years; Pan-American countries, $10.00 for one year, $17.00 for two years, $24.00 for three years; all other countries $15.00 for one year, $25.00 for two years, $35.00 for three years, payable in U.S. currency. Single copies $0.75 each in the United States, its possessions, and Canada; all other countries, $1.50 (except the September Encyclopedia Issue, which is not sold separately). Printed in the U.S.A., by Hildreth Press, Inc., Bristol, Conn.

*Reg. U.S. Pat. Office.

Another new development using

B. F. Goodrich Chemical *raw materials*

B. F. Goodrich Chemical Company does not make these panels. We supply only the raw materials.

Rigid vinyl windows beat double trouble

WHAT do you do when windows are attacked from two sides? By corrosive fumes and hot air inside, and outside by the weather. A chemical plant in Texas had the problem and found the answer. In went new translucent panels made from Geon rigid vinyl—out went the old windows and a costly maintenance problem!

Installing the green-tinted corrugated panels was easy—they were simply nailed in place. Because they are made from Geon, they resist sunlight, cold, rain, acids, alkalis, oil and grease. They are decorative as well as functional.

Products made from Geon rigid vinyl include corrosion-proof pipe, fume ducts, tanks, trays, materials that can be machined, planed, sawed, drilled, and cemented. You'll find other Geon polyvinyl materials in flexible, colorful upholstery, in high-dielectric insulation, in wear-resistant flooring, in hundreds of other successful products.

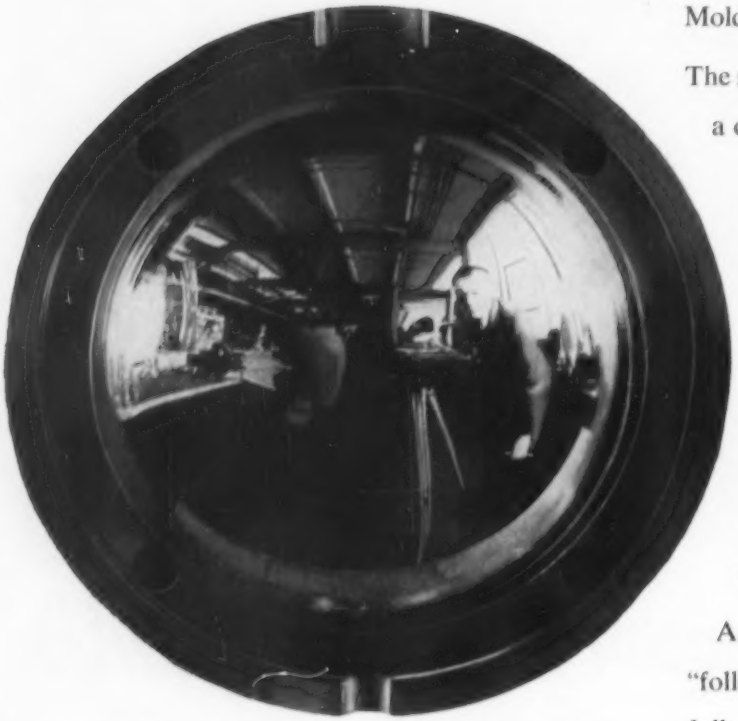
Geon's remarkable physical and chemical properties may give your products a decisive competitive edge.

For technical information, please write Dept. BR-10, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.

GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

HOW ECONOMY IN PLASTICS PARTS **starts** WITH THIS **finish**



Here's part of an injection-type mold for making Lucite parts. With this superb mold finish, perfect product transparency is assured.

CHICAGO MOLDED
PRODUCTS CORPORATION
1046 North Kolmar Avenue
Chicago 51, Illinois
Phone: Dickens 2-9000
CUSTOM MOLDERS OF ALL
Plastics

Precision mold finishes mean lower costs for you. For they mean less product polishing . . . fewer rejects, both in manufacture and during your final assembly. It's one reason why Chicago Molded *bid prices* are usually competitive, even though Chicago Molded *products* are superior.

The secret lies in our unbeatable facilities: a complete research and testing laboratory . . . one of the largest and finest mold-making shops . . . coupled with virtually every type and size of production press—from the smallest to the world's largest . . . an extensive corps of engineers, designers and research men; as well as highly skilled mechanics and craftsmen.

And don't forget Chicago Molded "follow-up" service. Our products are carefully watched by our engineers, even after you begin to use them. These men keep following up, helping you eliminate costly frills . . . suggesting better molding materials . . . even developing whole new processes *to help make your products better, more saleable, lower-priced.*

So bring your next plastics job to Chicago Molded. But remember, you'll get the most out of our service if you talk with us before your designs are final.

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EDITORIAL

Toward Better Building

With little fanfare, a tremendous amount of work is being done in the interests of more satisfactory applications of plastics in the building field.

Almost every major material-making company is engaging in special research in this matter, either by using its own facilities or through sponsored research at university level. The numerous divisional groups under the auspices of the Society of the Plastics Industry—such as the Thermoplastic Pipe Division and the Reinforced Plastics Division—have also been working in cooperation with building code commissions in various states, with standards organizations, and with insurance bodies with a view to improving and increasing plastics applications in building.

The results of all these quiet activities are beginning to be distributed in brochures, in memoranda, in progress reports, and in committee bulletins.

A most significant long step forward has been taken by the S.P.I. Code Advisory Committee which has promulgated a modern building code embracing the use of plastics in all types of building construction.

This model code, for which the San Francisco building code was used as a guide, is to be circulated among interested parties and organizations and, after correction and clarification, is to be used to assist the industry in educating municipal building code officials.

Out of this all work should come, in time, municipal building codes in which properties of the various plastics materials are recognized and provision made for their advantageous use.

This Year's Toys are Better

In an editorial in the March 1955 issue of MODERN PLASTICS, it was pointed out that the volume of plastics which went into toys in 1954 suffered a loss of at least 5%, and probably more, in comparison with the 1953 volume. It was also stated that an analysis of the market indicated that the damage which resulted in this loss was done in the toys for the biggest age group: toys for children under five—low-priced toys, from 19¢ to $1.98.

The challenge of the 1955 toy market has been taken up by plastics material makers, toy designers, and manufacturers of plastics toys for this youngest group. The plastics toys which will be offered to infants this Christmas are, in our opinion, generally better designed, better engineered, and more thoughtfully constructed, from the standpoints of durability and play value, than any ever offered before. And our opinion is supported by opinions of toy design authorities, by numerous field tests on the part of manufacturers, and by orders being placed by retail merchandising buyers.

The increased use of the polyethylenes and of other materials with improved impact strength and heat resistance, the improvements in molding and bonding techniques, and careful psychological studies of infant play habits have been combined to create a new type of plastics toy for a new era.

It is our belief that the steps taken this year to improve plastics toys will result, not only in a bigger market for plastics toys this year, but bigger markets for years to come.

Completely New Low Cost All Steel Granulator

outperforms any beside-the-press grinder of comparable size and cost

Never before have you been able to get such outstanding performance from a grinder that costs so little. The new B&J M-100 is ideally suited for beside-the-press grinding, and, with its capacity up to 200 pounds hourly, can also be used as a batch grinder. It grinds all plastics, including elastomerics such as *polyethylene*, without fluffing. Double shear knife action readily cuts hard or soft plastics – hot and cold sprues can be fed simultaneously.

The M-100 is simpler to maintain, simpler to operate, simpler to clean than any machine on the market. Completely enclosed, it stays clean longer. The extra large sight glass shows operator when bin is filled. The extra large bin holds more, slips in and out with ease.

The M-100, first of the MARVEL LINE SERIES of all steel Ball & Jewell Grinders, is backed by the experience which has made Ball & Jewell leaders in the field for over 50 years. Standard equipment includes 1½ HP motor and starter, 2 or 3 HP optional. Casters included at no extra cost.

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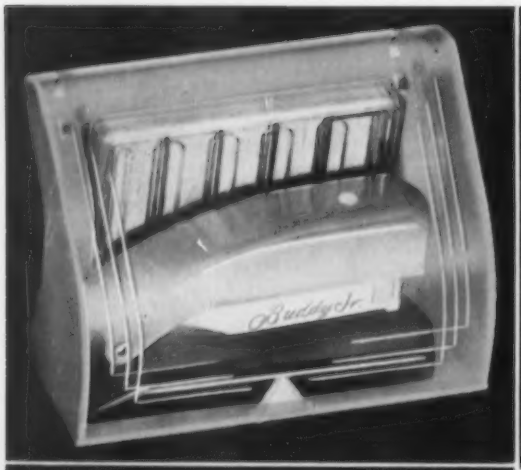
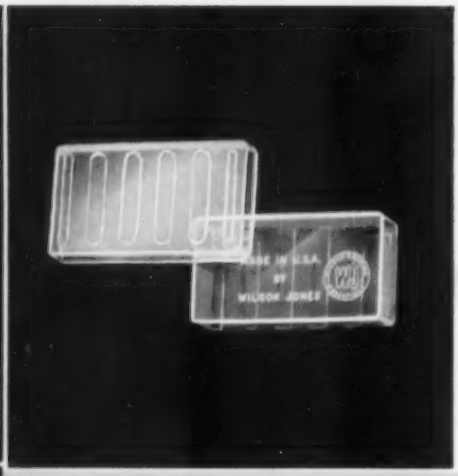
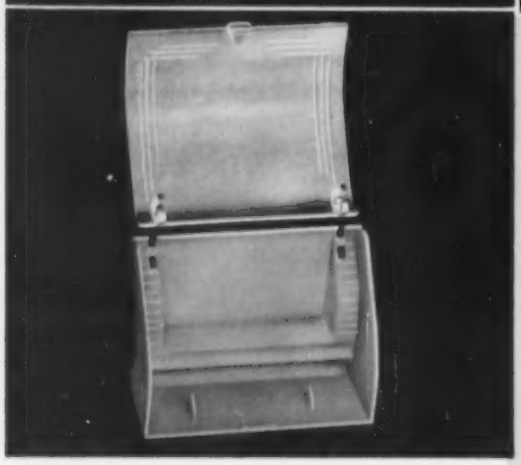
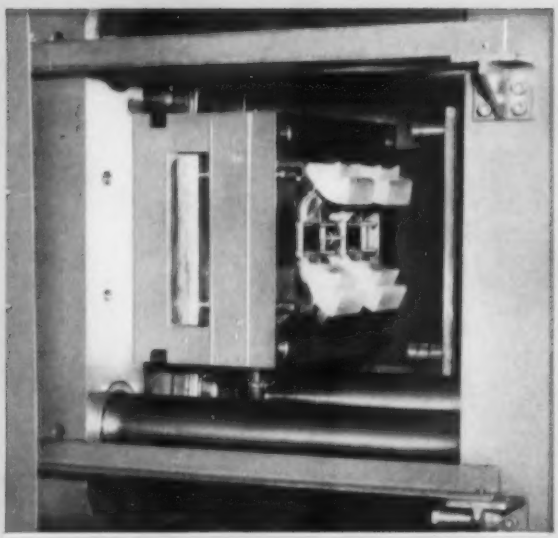
B & J HOPPER HEATER-DRYERS • PNEUMATIC MATERIAL DISCHARGE SYSTEMS • EASTERN REPRESENTATIVES—LEWIS INJECTION MOLDING MACHINES









12-cavity, hot-runner molds are used for tops and bottoms of the small box that holds extra staples. Total shots weigh 58.9 and 62.9 grams respectively. On the first 100,000-piece run, Dillon-Beck averaged 1,850 tops and 1,800 bottoms per hour. 4-cavity molds are used for the larger parts. Inset shows the "REED" injection molding machine stopped, with 4 large bottom pieces about to be ejected automatically from the die.

Fully Automatic 175T-4/6 "REED" Molds New Stapler Package at Dillon-Beck

This smart, new polystyrene stapler package, molded by Dillon-Beck Manufacturing Co., consists of four parts. All are molded on *fully automatic* 175T-4/6 oz. Reed-Prentice injection molding machines equipped with low pressure die closing units that protect the molds during automatic cycling.

Dillon-Beck's satisfaction with their "REEDS" is typical of the easy operation and minimum maintenance molders in nearly 1,000 plants have experienced. Every model — from the 175T-4/6 oz. to the big 600T-32 oz. size—combines rugged strength and economical molding efficiency, gives you design features such as positive mechanical locking pressure and extra-strong tie bar construction.

And now a standard on all machines, the new "REED-SPEED" heating cylinder means faster, more thorough plasticizing and lower cost. To get full information on the complete line of injection molding machines, call the nearest Reed-Prentice Sales Engineer.

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A molding is a molding is a molding...

A lady named Gertrude Stein made quite a bundle for herself, writing lines like the one above. "A rose is a rose . . .," etc.—remember? Her point seems to be that, taken all in all, one rose is much like any other.

Except, we'll point out, except for the rose that sticks you.

And likewise with moldings. "A molding is a molding," some customers say—until they get stuck with one that's way out of line on price, quality, and/or delivery schedule.

Let's face it: fine moldings, like fine roses, require skill, care, and a lot of experience to produce. We should know. We've been custom molders for practically 35 years, and these are the three sturdy virtues our reputation has been built on.

So do yourself a favor. Call on Boonton for your next plastic molding job. You'll get high-quality pieces, delivered on time and at the right price. What you won't get are brave promises and limp excuses. You see, we're not orators. We're just hard-working custom molders—compression and injection.

BOONTON MOLDING CO.

BOONTON, NEW JERSEY

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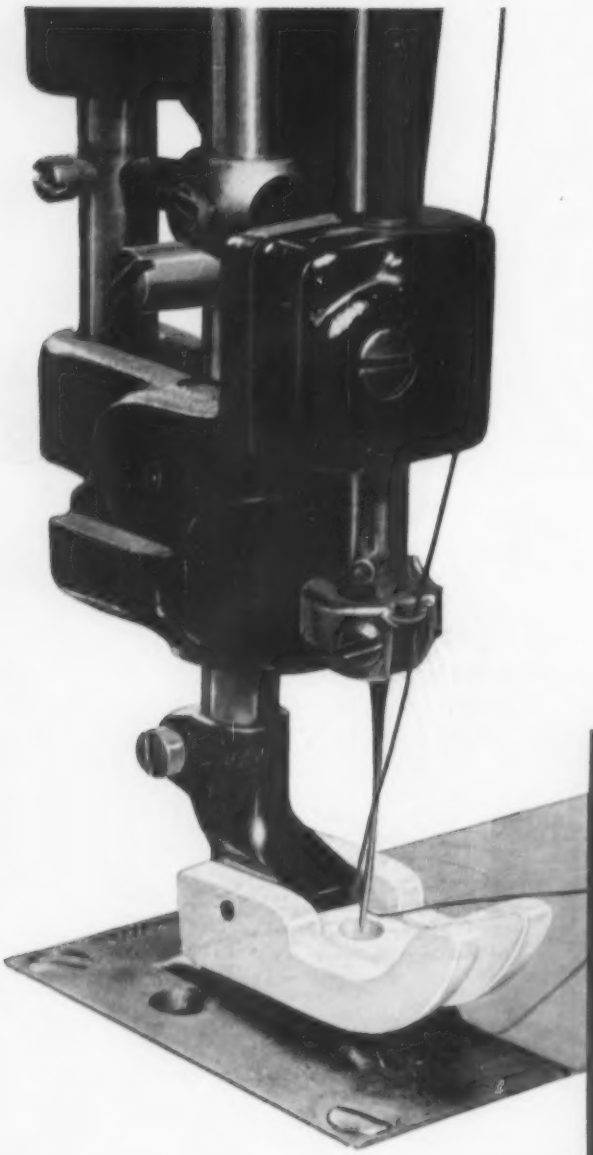
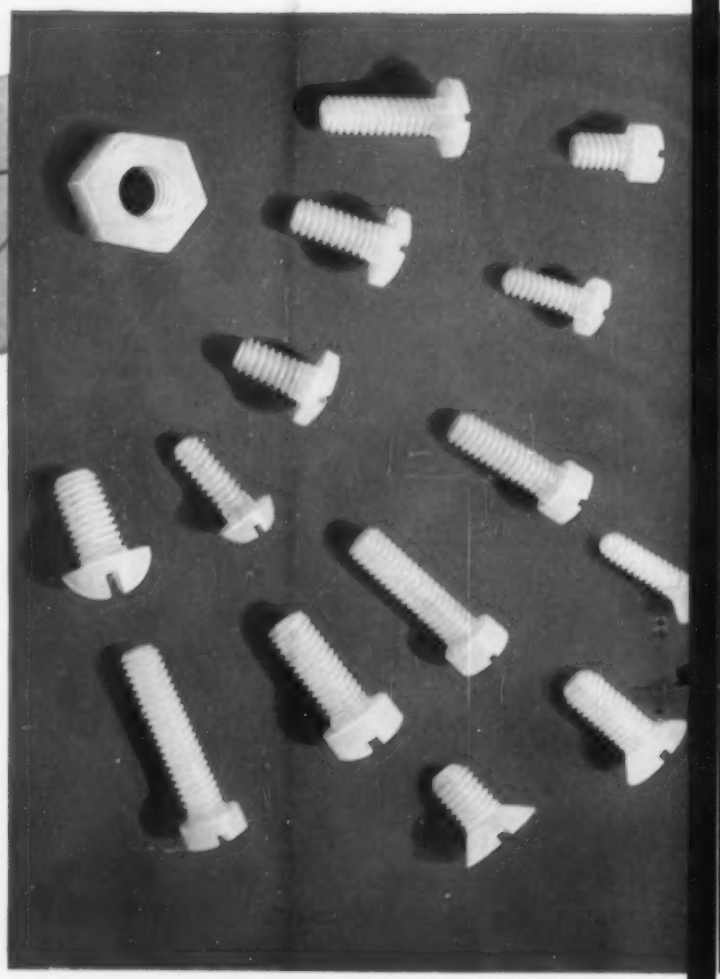
4 more examples of



TEFLON® has a smooth, low-friction surface which improves presser foot operation on commercial sewing machine.



ZYTEL® is machined to form fasteners which don't shake loose because of vibration, which resist high temperatures and have good dielectric strength.

ALATHON® is used for this vial that can be flipped open or snapped shut with one hand—because of its integrally hinged lid.

LUCITE® is molded into effective safety lenses with excellent reflective properties—lenses resist crazing and weathering.

advanced product engineering

Be sure to investigate the Du Pont family of engineering materials. Their useful properties may help you solve a particular design or engineering problem—as exemplified by the manufacturers' products described below:

TEFLON tetrafluoroethylene resin is made into a presser foot used on industrial sewing machines. This foot guides material as it goes under the needle. This machine is designed primarily for sewing difficult materials such as rubberized fabrics. "Teflon" has a low-friction surface which improves the mechanical operation of the sewing machine and eliminates need for a walking foot mechanism. (Manufactured by the Chase Sales Company, Hayward, California.)

LUCITE acrylic resin helps eliminate "sitting ducks"—cars or trucks stalled on the highway which can't warn oncoming vehicles of their predicament. The Vari-Flare contains lenses injection-molded of "Lucite." They can be seen a half mile or more. "Lucite" is dimensionally stable, resists crazing and breakage, and retains its superior optical properties. Sunlight and extremes of weather do not affect parts molded or extruded of "Lucite." (Manufactured by Vari-Products Company, Chicago, Ill. Lenses molded by Stimsonite, Chicago, Ill.

ZYTEL nylon resin is specified frequently as a superior engineering material from which to make fasteners of many kinds and sizes. The "Nylo-Fast" fastenings shown at the left are an excellent example. These precision-machined bolts are lightweight and durable. "Zytel" is resilient, and this property keeps vibration from shaking the fastenings loose. The electrical insulating properties of "Zytel" are excellent. Nor will temperatures as high as 250°F. affect the "Nylo-Fast" parts of "Zytel." Where color coding is desirable, the fastenings can be colored. (Manufactured and stocked by Anti-Corrosive Metal Products Company, Inc., Castleton-on-Hudson, New York, from rod stock supplied by The Polymer Corporation of Pennsylvania, Reading, Pennsylvania.

ALATHON polyethylene resin is molded into a vial having an attached integral lid. With this closure, a flip of the thumb opens the containers. Snap it back, and it's closed. Because it's molded of "Alathon," the vial is shatterproof, lightweight and has a very low rate of moisture transmission. Contents are visible through the "Alathon," and a label can be used inside or out. (POLYVIAL molded by Olympic Plastics Company, Inc., Los Angeles 16, Calif.)

Evaluate your own design problems in terms of the Du Pont engineering materials. For complete property information, use the coupon at right or write to: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room 3010 Du Pont Building, Wilmington 98, Delaware.

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Please send me more information on the Du Pont engineering materials checked: ☐ "Lucite"* acrylic resin; ☐ "Zytel"* nylon resin; ☐ "Teflon"* tetrafluoroethylene resin; ☐ "Alathon"* polyethylene resin. I am interested in evaluating these materials for

_____

Name _____ *Position* _____

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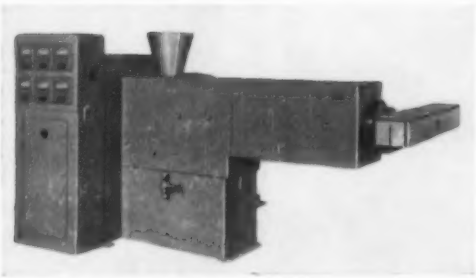
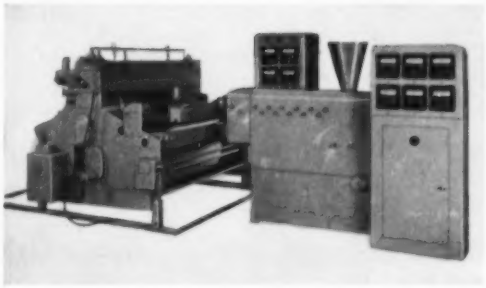
Traver-IAPM unit for making polyethylene printable

2½" MPM extruder with seven controls and 4" tubing die



4½" MPM Extruder with a screw-to-barrel ratio of 16:1 or 20:1

In the United States
and in 31 other countries
easy-to-use MPM machines are producing quality extrusions



Flat sheet extrusion installation

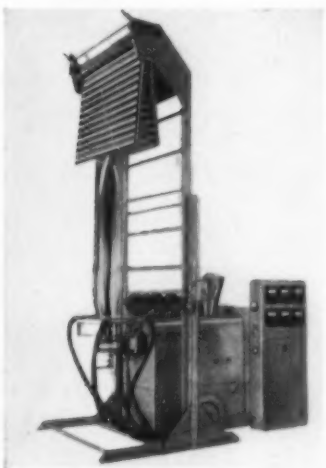
Tubular packaging film installation on 3½" MPM extruder

- **Easy to install**
- **Simple to operate**
- **Rapid changeover**
- **Precise heat control**
- **High thrust capacity**
- **Corrosion resistant construction**

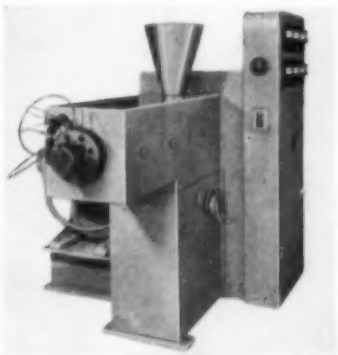
MPM extruders and accessory equipment are at work in factories all around the globe. Many of these machines were put into operation from instruction data supplied with our equipment, an index to the simplicity of MPM extruders. We often supply complete plants, including dies, ready to produce the customer's products.

Write to us or visit our plant for additional information on the equipment recommended for your requirements.

Write for descriptive literature



2½" MPM extruder



West Coast Representative:
4113 W. Jefferson St., Los Angeles 16, Calif.

modern plastic machinery corp. mpm

15 Union St., Lodi, N. J., U. S. A.
Cable Address: MODPLASEX

Capitalize on your Calender

with postformable sheets of new Plio-Tuf C75

HERE'S one way to squeeze more profits out of existent equipment: Capitalize on the booming, postforming market by calendering wide sheets of new PLIO-TUF C75.

It is estimated that 20,000,000 pounds of resin were consumed by the sheet forming industry in 1954. It is predicted that this consumption will soar to 200,000,000 pounds by 1960.

A high proportion of the resins used for rigid sheets is of the styrene type. And that's where PLIO-TUF C75 comes into your picture.

PLIO-TUF C75 is a brand-new, modified styrene resin—specifically designed for the calendering of sheets. It is an internally reinforced resin offering decided advantages over similar materials. It is a resin that will enable you to make a premium profit product on existent equipment.

The outstanding features of PLIO-TUF C75 are its high resistance to impact, particularly at low temperatures, coupled with its unusual resistance to distortion by heat and excellent stiffness. Moreover, the light color, low specific gravity and warmth of PLIO-TUF C75, plus its excellent abrasion-, chemical-, electrical- and age-resistance, give it properties equal or superior to similar sheet forming resins.

Why not learn more about how you can make the most of your calender with PLIO-TUF C75? Samples and technical help are yours by writing to:

Goodyear, Chemical Division, Akron 16, Ohio

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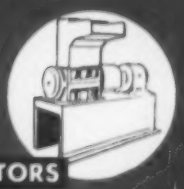
In Plastics Reducing Machinery, Look to CUMBERLAND for the COMPLETE LINE



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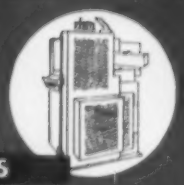

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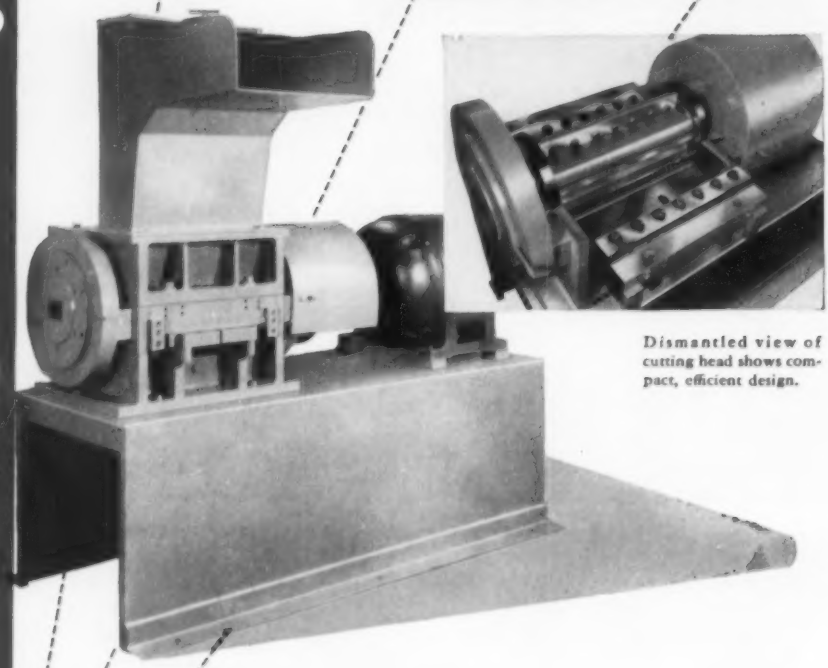
PREBREAKERS

MODEL 20 All Steel Granulator

CUSTOM ENGINEERED QUALITY BUILT



Dismantled view of cutting head shows compact, efficient design.

1 HEAVY DUTY — Large flywheel—thick all-steel weldments—deep welds—parts are of flawless wrought steel (not steel castings)—machine resists wreckage.

2 LARGE THROAT OPENING — 8 by 20" size.

3 PRIOR BANDSAWING NOT NEEDED — Machine specially built to handle large chunky parts such as bleeder scrap, cylinder purgings and heavy cast slabs of polystyrene, modified polystyrene and acrylic resins.

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California Representative:
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WHO BUYS AS CHEAP as Mortimer Threep ?

From paying retail price he shrinks.
What price these "hot"—and so-called—minks?

"Duty," says Mort, "is just for jerks".
Three guesses who will get the works!

So it figures that Mortimer's just as wise
When it comes to his molded plastics buys.
Cheap tools—and press-time bought under cost—
And tomorrow, his source will be broke or lost.

There are many "bargains" in today's buyers' market. The "New Low Price" (to get the business) is often quoted at less than half the going fair price of last year. This is due solely to the desire to fill a press at any price—not, sad to say, due to technical developments. Hence, what price that part when that press can be filled for someone else more profitably? Or when red ink catches up with that molder?

Today, as always, the biggest bargain in custom molded plastic parts is the proper choice of an able, stable molder. You're money ahead when you settle on the company that:

—Knows its costs today—and tomorrow!

—Will honestly appraise its ability to perform for you

—Knows materials old and new, and recommends wisely

—Evaluates your tooling needs and tools accordingly regardless of initial cost

—Will still be here to handle your job in the years to come

If your molding needs include thermosetting plastics of any type—or the fluorcarbons—we're a company that's grown for decades by living up to those very specifications. Why not talk your problem over with us—and leave the fire-sale bargains to your competition? We'll come running!

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Specialists in Thermo-Setting Plastics for 37 years

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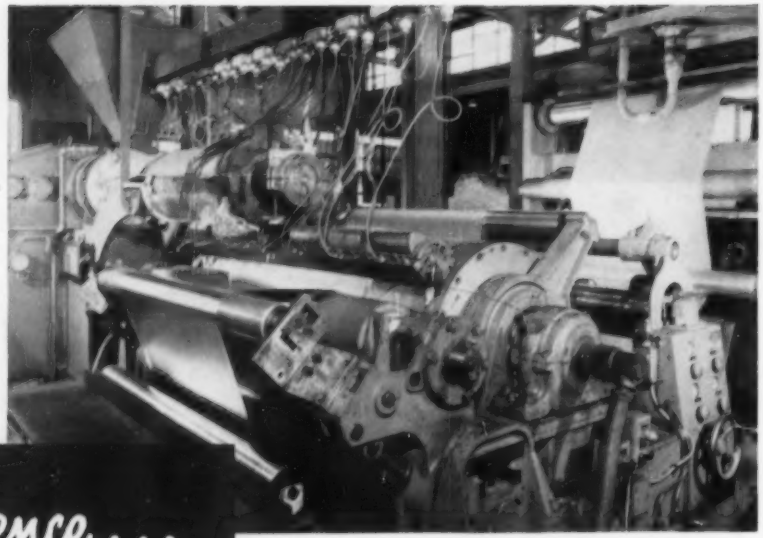


Model PL-1000 with 26" cooling drum.
Courtesy of Continental Can Co., Mt. Vernon, Ohio

You buy experience...

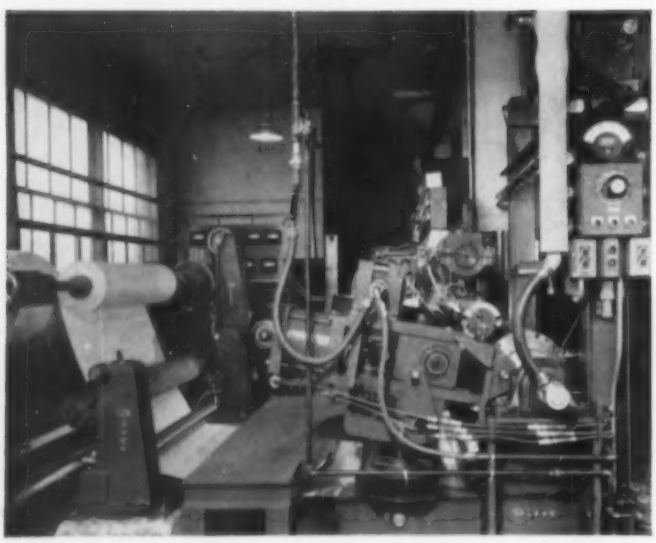
with a Dilts POLYETHYLENE EXTRUSION LAMINATOR

YOU BUY . . .

the experience of the leading converters whose ideas are incorporated in the Dilts machines to provide the optimum operating features in the laminator.

the experience of leading extruder manufacturers whose equipment Dilts includes to provide you with a complete package installation.

the experience of Dilts, experts in continuous unwinding and winding equipment, so essential to successful production on polyethylene laminators—designers of both high speed, high production converting equipment and a variety of standard units for low and medium duty operation.



Model PL-400 with 15" cooling drum.
Courtesy of Rapinwax Paper Co., Minneapolis, Minn.

THE BLACK-CLAWSON COMPANY

DILTS MACHINE WORKS DIVISION • FULTON, N. Y.

HPMs FOR EVERY MOLDING JOB

THE MOST COMPREHENSIVE LINE OF PLASTIC MOLDING EQUIPMENT

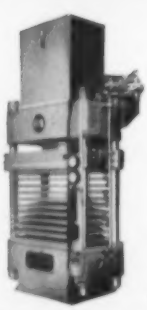
Choose the method best suited to your needs, then select an H-P-M press to do the job! From the first acceptance of plastics as a highly feasible commercial material, H-P-M has been designing and building molding machines for the plastic industry. Today, H-P-M offers plastics machines for every job—injection, compression, transfer, laminating and reinforced plastics — machines designed to give molders larger capacities . . . faster cycles . . . fewer rejects . . . big savings in production costs.

Regardless of your molding application, you'll handle the job better and faster with an H-P-M. Investigate now how an H-P-M will help your production. There's an H-P-M plastics engineer as near as your telephone . . . call him today.

REINFORCED

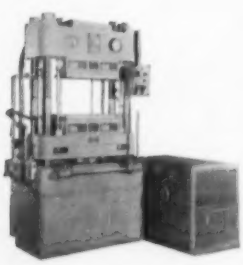
A complete line of stock presses from 50 to 200 tons, designed specifically for molding reinforced plastics. Larger sizes built to order. Write for Bulletin No. 5404!

LAMINATING



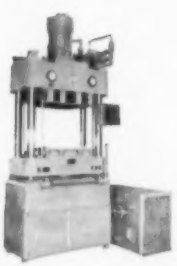
Multiple hot plate presses with steam or electrically heated plates for compressing or curing laminated material. Built to customer's requirements.

COMPRESSION

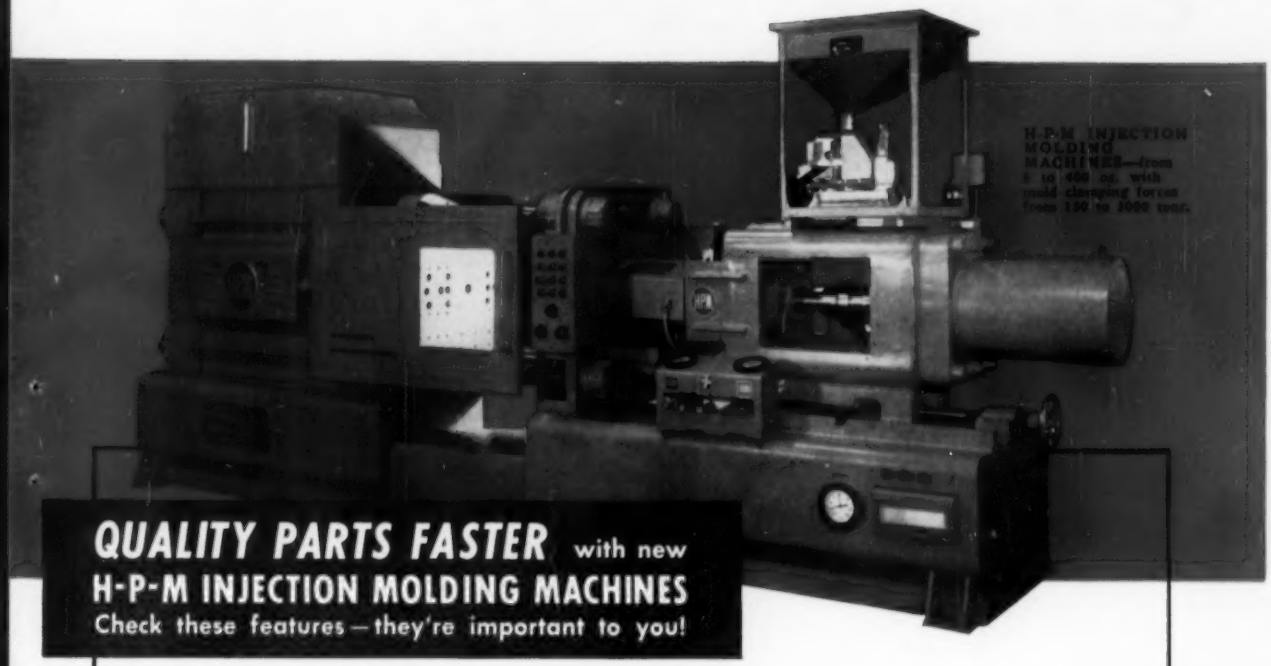


Stock sizes 100, 200, 300 and 500 tons. Larger sizes up to 2500 tons built on special order. Write for Bulletin No. 4901!

TRANSFER



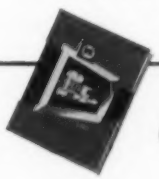
Stock sizes 100, 200, 300 and 500 tons. Larger sizes up to 2500 tons built on special order. Write for Bulletin No. 4901!



QUALITY PARTS FASTER with new H-P-M INJECTION MOLDING MACHINES

Check these features—they're important to you!

- **FULL HYDRAULIC MOLD CLAMP** provides fast closing and opening speeds with automatic adjustable slow downs. No adjustments required for different mold thicknesses, which mean big savings in mold set-up time.
- **EXTRA-LARGE PLATENS** will accommodate big molds . . . located at ideal operator height, requiring no platforms or pits.
- **ACCURATE, COMPENSATING WEIGH FEEDER** is standard equipment on all conventional, large capacity models.
- **PLENTY DAYLIGHT & STROKE** permit production of deep parts. Quick changing ram spacer permits use of thin molds without bolsters.
- **OVERHEAD OIL TANK** keeps oil clean and provides gravity prefill for fast clamp pressure build-up.
- **HIGH-SPEED INJECTION UNIT** combines new high-output, 3-zone plasticizing chamber with injection plunger speeds over 50% faster than on previous models. Entire injection unit can be retracted hydraulically.
- **NEW H-P-M HYDRAULIC CIRCUIT** employs exceptionally quiet pumps and a new leakproof manifold sub-plate valve system which reduces hydraulic piping to a minimum.



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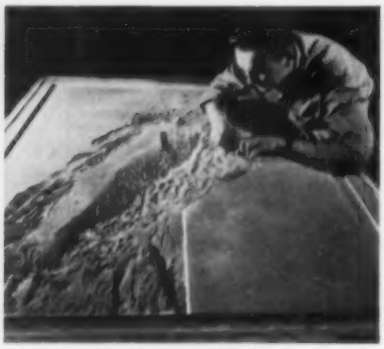
HPM

Certain-teed Densite® Plaster
gives best results in vacuum forming at Aero Service Corporation

Largest commercial survey firm in the world, Aero Service Corp. of Philadelphia has photographed and surveyed over 2,000,000 square miles of the earth's surface. Here a rubber mold (made from an aluminum master) is used to make the Densite gypsum plaster mold on which the relief map will be proof formed.



Dimensional stability of the mold material is critically important in proof forming these relief maps, and few molding compounds are successful. Says the Manager of the Relief Model Division, "We have shifted to Densite exclusively . . . we know of no other plaster that can match it for proof forming."

In vacuum forming the plastic maps, a large number of .030" holes are drilled through the Densite mold. "With other plasters tested we have found it difficult to drill these small holes . . . With Densite there's no problem, it's a simple matter to get good, clean holes in a relatively hard material," Aero says.

Heating element moves in over the plastic sheet. A vacuum is created through the drilled holes, forming the plastic sheet in the contour of the Densite mold. With 15 pounds of pressure being exerted on each square inch, a 4′ x 6′ mold must withstand a weight of 51,840 pounds on its total surface.

The test sheet of plastic is checked for molding accuracy. With acceptable tolerances as low as .020", few molding compounds are suitable. The frequent heating and cooling cycles subject the mold to great thermal shock. The mold life of Densite is longer than that of any comparable product tested.

The finished plastic relief map is peeled off the Densite plaster mold. Aero Service Corp. concludes, "We find that Certain-teed Densite plaster is superior when it comes to recording detail . . . We like the fine surface of the Densite mold, which records every single detail of our aluminum masters."

All photos courtesy Aero Service Corp., Philadelphia

Certain-teed Densite has exceptional hardness and strength. Wherever accuracy, dimensional stability, fine surface, and long wear are requirements, it will serve you better than any other plaster. Our technical staff is always ready to assist you with any problem you may have. Write for technical data now.

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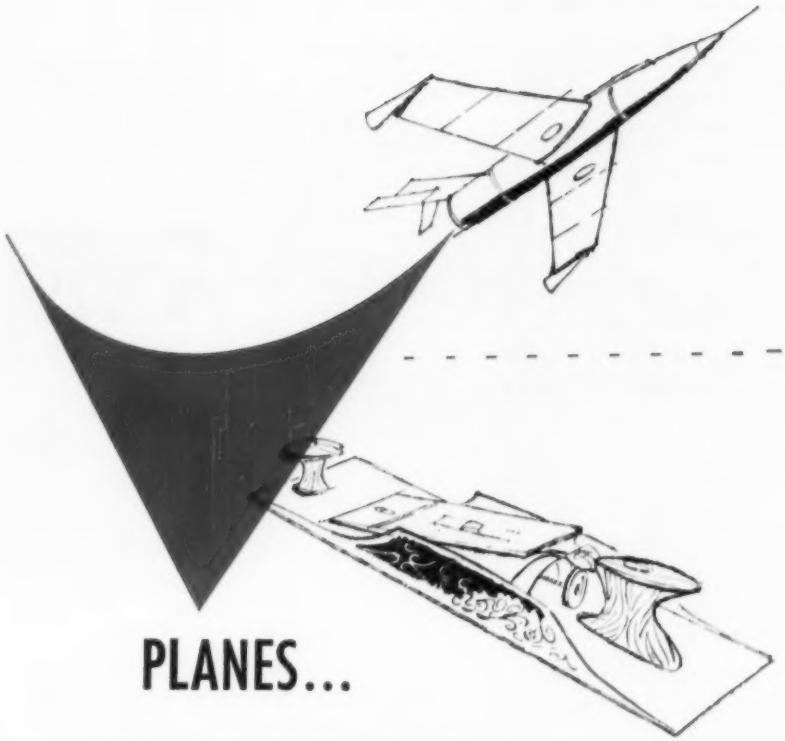


PLANES...

on the go with Plenco...

Whether for airport lighting equipment or high tensile strength tool components, you'll find phenolic plastics playing an increasingly important role. More and more, modern industry is using high quality phenolic plastics . . . and more and more users are turning to Plenco.

Plenco today is an integral part of the Plastics Industry. Plenco's great experience, plus its "*on the go*" policy of research, testing and special services have made it instrumental in developing better manufacturing methods—reducing production costs.

There is a Plenco phenolic plastic to meet your production problem. If you are a manufacturer or a molder "*on the go*," you will find it worthwhile to contact Plenco.

SHELL MOLDING CUTS COSTS!..

Whatever you are now molding in sand—whether it's aluminum aviation parts or iron skillets—it can be produced faster and at lower cost by shell molding with Plenco phenolic shell molding resins. For better cast products investigate Plenco shell molding resins—today.

PLASTICS ENGINEERING COMPANY
Sheboygan, Wisconsin

ammonia-free
for electrical applications...
PLENCO #369
general purpose molding compound

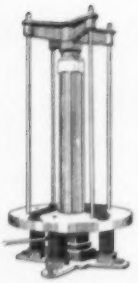
This one step phenolic was specially developed for use in electronic components where non-corrosion of silver or copper connections is important. Its fast rate of cure, splendid moldability, moisture resistance and minimum odor are further advantages in the use of Plenco 369. If you would like more information about this material or other Plenco phenolic molding compounds write or call.

PLENCO PHENOLICS
FOR BETTER PLASTIC PRODUCTS

Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

in the good old days

When it was necessary to reinforce the floor under the weight-type accumulator installation . . . when the maintenance gang held its breath to see if the old accumulator would rise far enough to keep pressure in the lines . . . when it was possible to keep packing on the accumulator ram only for a week or so



ERIE FOUNDRY WAS A GREAT NAME IN SPECIAL HYDRAULIC EQUIPMENT

today...we're still pioneering...

Erie Foundry offers this compact, lightweight, minimum maintenance hydraulic power system with many worthwhile advantages:

- a 10 h.p. electric motor which drives
- a 300# accumulator for low pressures, and
- a 2000# air bottle with a separating cylinder for high pressure, which is charged by
- a small radial air compressor driven by
- a 7½ h.p. electric motor, plus
- a control unit—electric, of course.

It has safety controls for both high and low pressure oil systems.

This pictured ERIE Hydraulic Power System is designed to supply 6 314-ton rubber-molding presses having 18" stroke plus 6 lift tables all based on a 3 minute cycle.

Similar ERIE Hydraulic Power Systems are available in all sizes to suit your requirements.

Several very good reasons why . . .

ERIE FOUNDRY IS THE GREATEST NAME IN SPECIAL HYDRAULIC EQUIPMENT

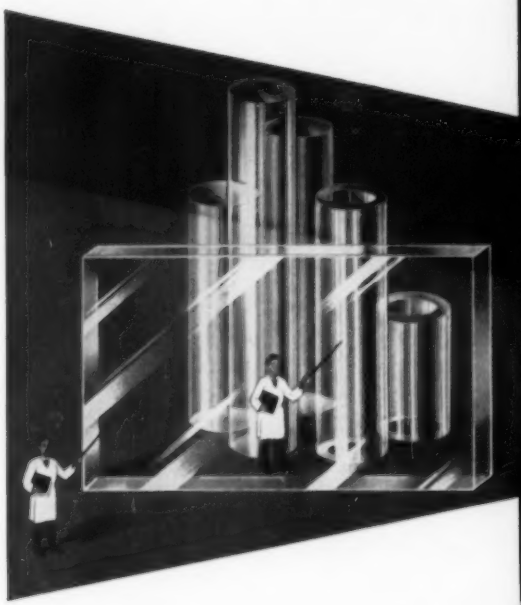
ERIE

in our 60th year

for more information call or write

HYDRAULIC PRESS DIVISION

ERIE FOUNDRY CO. ERIE, PA.



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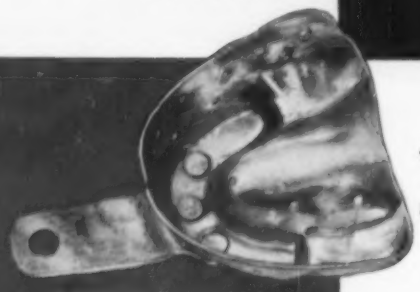
Richardson design and molding service..

Reduces Unit Cost From 75¢ to 11¢!



BEFORE 75¢

The problem: This is a metal tray . . for taking dental impressions. Because trays of this type were relatively expensive (75¢ each), dentists found it necessary to clean and re-use them. In spite of careful cleaning, the trays would corrode, oxidize, discolor and, after repeated use, become generally unattractive.

What was done about it: The Wm. Getz Corp., Chicago, asked Richardson to recommend a material and design a new plastic dental tray. Richardson engineers suggested a clear polystyrene material and designed and constructed, for economical production, this complicated 10-cavity mold weighing 2322 pounds.

AFTER 11¢

The result: This plastic dental tray is more sterile and has much better eye-appeal. It costs only 11¢ instead of 75¢ . . a savings of 85% which permits the dentist to discard each tray after it has been used. Tedious time-consuming cleaning of old metal trays is no longer necessary.

Are you redesigning your product for better sales-appeal? Richardson engineers, consulting with your own engineers, can help in the development of design changes for better performance, improved appearance, and lower production cost. Complete laboratory facilities are available for the development of special plastic materials for your applications. Experienced Richardson tool and diemakers can produce your molds for efficient parts molding.

For detailed information write or phone The Richardson Company. 2789 Lake St., Melrose Park, Illinois (Chicago area)

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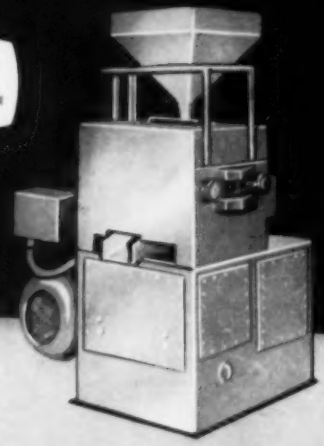
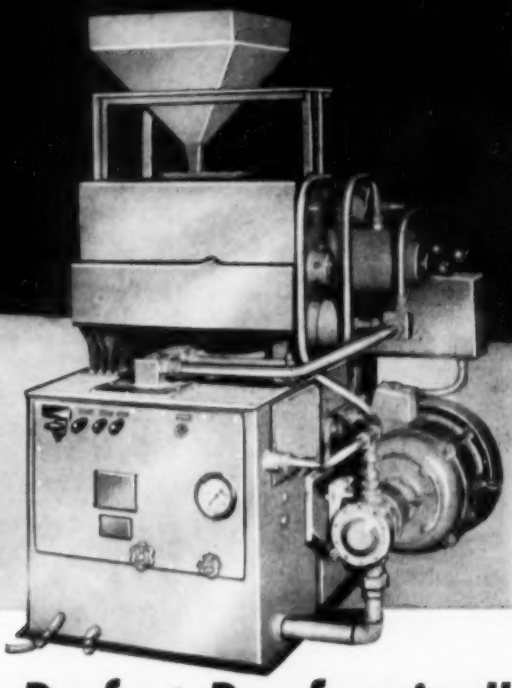




"Key Unit for Perfect Pre-forming"

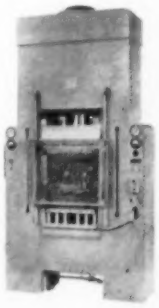
Interested in economical, trouble-free pre-forming? Famous BIPEL Horizontal Pelleters offer controlled hydraulic operation with high production speeds . . . all in a self-contained, quiet, dust-free unit! You'll get *uniform pellet density* because the free-riding die permits equal pressure (in a *steady squeeze*) by *both* punches . . . *economy* with no powder loss, low maintenance and unattended pellet discharge . . . *maximum safety* to costly dies and punches, with no moving parts ever entering between punches . . . and *service* behind your pre-former with replacement parts in stock right here for immediate shipment. All backed by BIPEL's years of production experience! Before *you* buy, *get complete information*.

maximum pressure	12 tons	35 tons	70 tons
maximum strokes per hour	2600	1500	850
typical pellet weight*	.2—1.2 oz. (1½" dia.)	3.7—8.1 oz. (3" dia.)	8.3—18 oz. (4½" dia.)

*based on average powder density of .35 ozs. per cubic inch

"BIPEL" is a Registered Trade Mark *World patents granted or pending*

BIPEL Compression-Transfer Presses are perfect companions to the Pelleters. Rejects are virtually eliminated with the famous "Auto Control", reproducing any conceivable molding cycle at the touch of a button! You'll get several extra cycles per hour, plus closer temperature control and a more effective heat transfer to the work. You'll get a self-contained drive system, or an economical out-of-the-way central system delivering 1000 psi, with pressure doubled or tripled within the press. You'll choose between 3 ranges of pressures from 20 to 340 tons. See these units in operation at Tiverton, R. I. and write for complete details.



Here are a few prominent firms who have installed BIPEL Pelleters recently:

Ucinite Company	Newtonville, Mass.
Northern Industrial Chemical Co.	So. Boston, Mass.
Romar Plastics, Inc.	St. Charles, Ill.
Harry Davies Molding Co.	Chicago, Ill.
Molded Products Div. of Admiral Corp.	W. Chicago, Ill.
Breyer Molding Co.	Chicago, Ill.
Whitso, Inc.	Schiller Park, Ill.
Van Norman Molding Co.	Chicago, Ill.
Thermo Products, Inc.	Albany, N. Y.
Pure Carbon Co.	St. Marys, Penn.
Milwaukee Plastics, Inc.	Milwaukee, Wisc.
Gordon Chemicals, Inc.	Wilmington, Del.
Gibbs Manufacturing Co.	Berkley, Calif.
Garde Manufacturing Co.	Providence, R. I.
Dolphin Molding Co.	Newport News, Va.
Dickten & Masch Manufacturing Co.	Milwaukee, Wisc.
Suss Brothers, Inc.	Albany, N. Y.

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RALPH B. SYMONS ASSOCIATES, INC.
3571 MAIN ROAD TIVERTON, R. I.

BIPEL Hydraulic Pelleters

DOW ANNOUNCES *a new* POLYETHYLENE

Optimum uniformity of material and granulation provides uniform low-cost molding operations

Uniformity—it's the key to good molding—but until today you've had to pay a premium price for specially processed polyethylene for optimum uniformity.

Now, with Dow's new polyethylene, you get optimum uniformity at *no extra cost.*

- *Uniformity of material* . . . Dow's process gives uniform molecular weight distribution and uniform physical properties.

- *Uniform granulation* . . . gives you optimum combination of uniform low bulk factor and uniform free flow and constant feed.

NEW, DIFFERENT, DEFINITELY SUPERIOR...

PITTSBURGH 508 PREFORM ROVING

All of our molding customers who have tried Pittsburgh's new #508 roving report excellent results. That's because PPG #508 really "outperforms" other known types of roving in producing consistently better preforms.

PPG #508 Preform Roving is definitely superior because it has been treated by a special sizing process to insure better chemical and mechanical bond between glass fibers and molding resin. Results: consistently high quality moldings, lower scrap rate, faster preforming.

Check out PPG's new 508 Preform Roving on your own molding jobs and see the difference. You can get complete information on standard packages and available sizes by simply contacting our executive offices or our district sales offices in Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, New York, Philadelphia, St. Louis or Los Angeles. Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.

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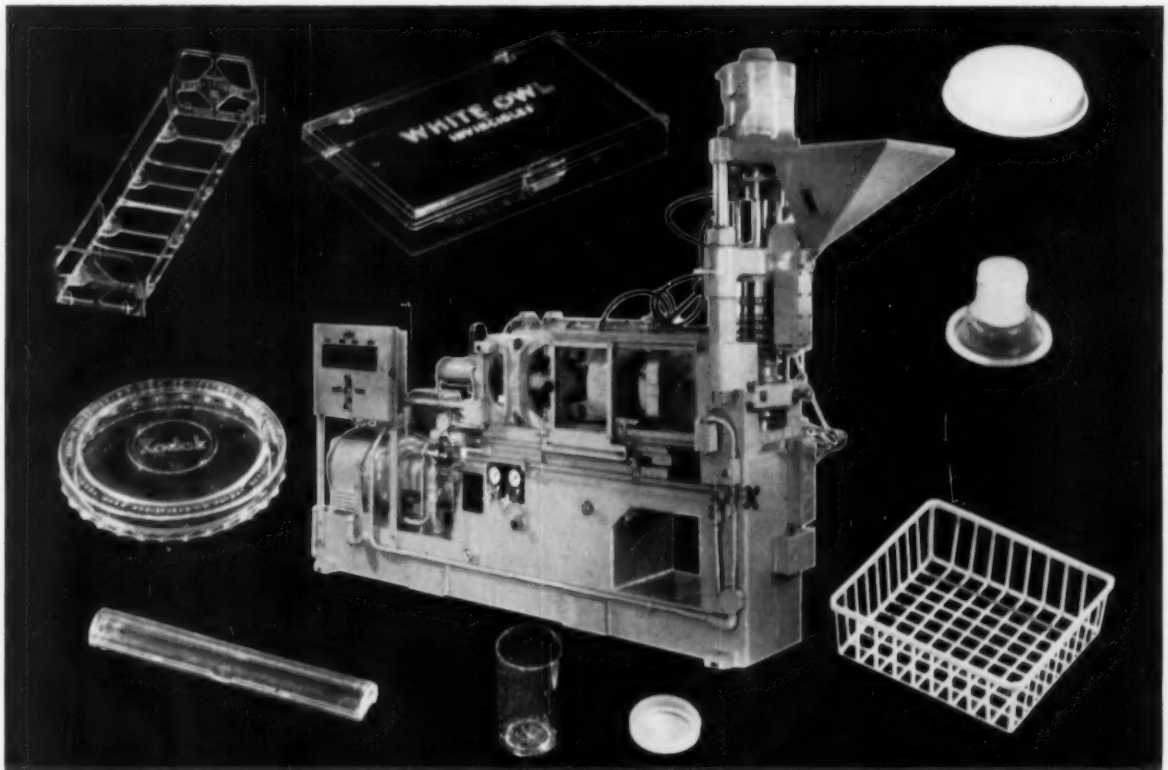
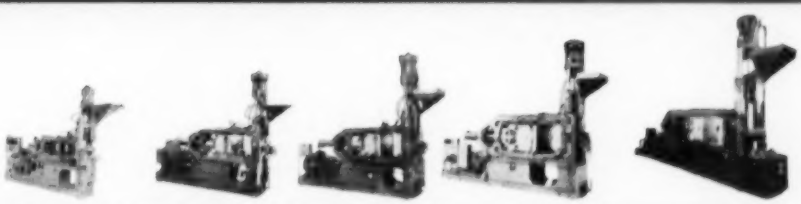


Lester AUTOMATIC
Injection Molding Machines



SHOT CAPACITY	4 OZ.	8 OZ.	12 OZ.	20 OZ.	48 OZ.
Locking Tonnage	125	300	400	600	750
Die Opening (inches)	9 to 6 Adjustable	10	12	14	16¼ or 30
Max. Mold Size (inches)	14V x 18H	23V x 28H	26V x 28H	28¼V x 40H	29V x 50H
Equivalent Bar Size (inches)	3½	6	6½	8	9
Dry Cycle (seconds)	6 at 6" opening	10	12½	13	20 at 16¼" opening

Complete specifications available on request from Lester...the only company devoted *exclusively* to the manufacture of injection molding machines and die casting machines.

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INTRODUCING...

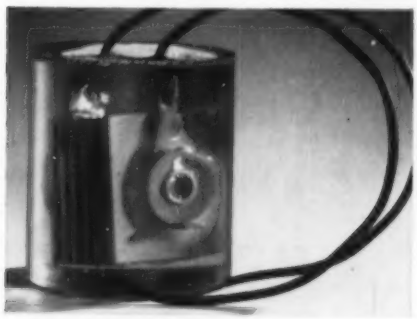
Versamid

GENERAL MILLS TRADE NAME FOR VERSATILE POLYAMIDE RESIN

General Mills polyamide resins have become so popular in industrial uses, they need and deserve a name of their own. So, General Mills has adopted the trade name "Versamid" for its polyamide resin. The extreme versatility of these resins amazes nearly everyone. You'll appreciate why when you try them yourself. On the next page, you will find brief descriptions and some of the uses for General Mills line of Versamids. For more information, use the coupon lower right.

HOW TO USE *Versamids* FOR PROFITABLE PRODUCTION

Coating paper posters or labels with Versamid, as above, results in a non-blocking film that proves a strong barrier against moisture-vapor penetration.



Tough, bubble-free Versamid-epoxy blends work wonders for electrical embedments, above. They have negligible shrinkage and high dielectric strength. Other special features are low exotherm, long pot life, excellent thermal shock resistance.

Only a few years new, Versamids already have won a big place for themselves in industry. For here are safe, easy-to-use resins that appeal to everyone in the plant—from workmen to formulators. Ask yourself if you can't use these outstanding features:

Versamids require no toxic, volatile or explosive curing agents, even when blended with epoxy resins for special properties. Nor are any volatile reaction products produced during curing. Also, we know of no cases of toxicity or dermatitis caused by Versamids.

They're compatible, too—with each other and with a large number of modifying agents. This allows them to fit your needs exactly. You can blend Versamids to control resin hardness, flexibility, gloss, melting point, heat-sealing temperatures and range, tackiness, and other properties. To extend their versatility further, you can get some Versamids uncompounded (to add plasticizers, waxes, modifying resins) or compounded (for other special properties).

Versamids have sharp melting points. Thus, they heat seal easily, set up quickly without blocking. They resist grease and oil, moisture, wax emulsions, anti-freeze, detergents, alkalis, mild acids, and many solvents and common corrosive chemicals. They may be held at high temperatures for long periods without harm, and are stable for long-term storage.

THERMOPLASTIC USES—Versamids are popular because they meet the needs of a remarkable range of uses. In thermoplastic form, they prove ideal for inks, packaging, overprint varnishes, paints . . . plus flexible adhesives or coatings for paper labels, metal foil, plastic bottles, leather goods, publication covers, and many more—often replacing expensive laminations.

THERMOSETTING USES—When blended with epoxy resin, the Versamid blends are thermosetting and exhibit a whole new range of valuable properties. They're tough and economical, have great adhesion, and resist many corrosive chemicals. They offer low exotherm, high dielectric strength, good heat and color stability, and show a longer pot life than an equivalent mass of monomeric amine-cured resins. As Versamid blends cure quickly, amber clear and relatively bubble free, they improve performance characteristics of glass laminates, pottings and castings, plastic tools and dies, to name but a few.

JUST OFF THE PRESS! New booklet describes each Versamid in detail. Tells where to use them and why. For your free copy write to General Mills or mail the coupon below.

We also manufacture Fatty Nitrogen Compounds and Fatty Acids.

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I am interested in investigating the use of Versamids for _____

_____

Please send me a free copy of your polyamide resin booklet, "Versamids . . . a Demonstration in Resin Versatility."

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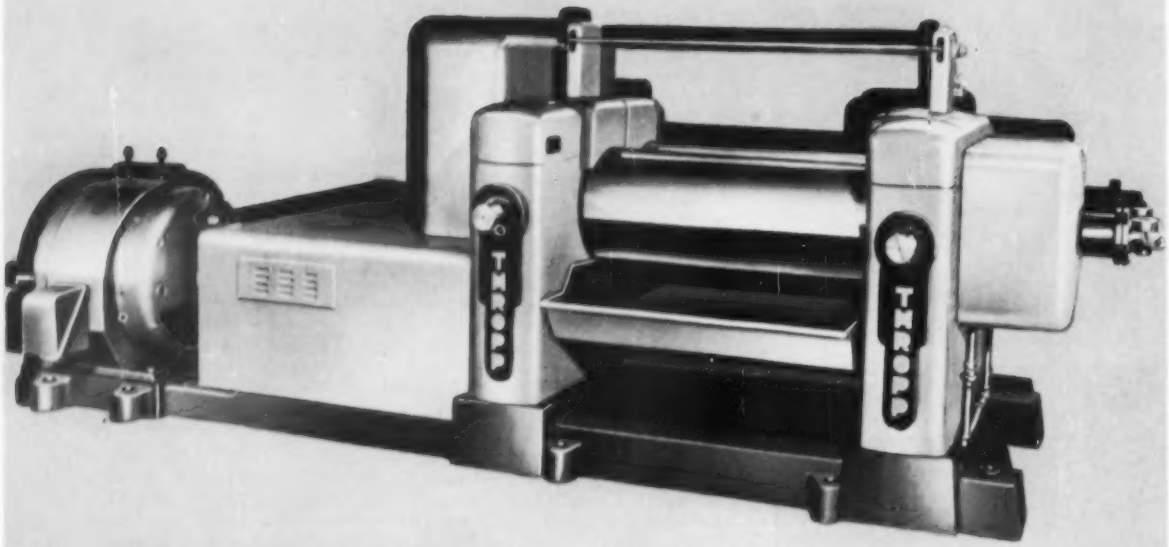
MP 10/55

The THROPP 60" MILL

earns the confidence of management



Thropp 22" x 22" x 60" Mill

This clean, streamlined Mill is a real workhorse, designed and built in every detail for dependable, uninterrupted production in the Rubber and Plastics Industries.

send for complete information

Wm. R. THROPP & Sons

Division of J. M. LEHMANN COMPANY, Inc.

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BALANCED STRENGTH
BETTER MACHINED
LONGER WEARING

Laminates with Lantuck® Base

Take textile bobbins for instance. Tests prove that Lantuck-based bobbin heads have vastly superior impact strength and nearly twice the impact fatigue value of those reinforced with a paper-canvas combination. Or Lantuck in vibrator blocks for textile looms. Service tests show a life 40 to 60 times as long as the wooden blocks they replaced.

What is Lantuck? It is a non-woven fabric which, because of its completely random distribution of fibers, gives laminates omni-directional horizontal strength. Plus—exceptional machineability at high cutting speeds. It's an economical filler for laminates requiring sharp projections or edges, mirror-like surfaces and superior mechanical strength.

Lantuck is one of many cotton and synthetic fabrics offered to the industry by Wellington Sears. Our nearest sales office has the full story as it relates to your laminating or coating problem.

Textile bobbin by Synthane Corp.

Wellington Sears

A Subsidiary of West Point Manufacturing Company

FIRST In Fabrics For Industry

For Coated Materials, High and Low Pressure Laminates And Other Reinforced Plastic Products . .

Wellington Sears Co., 65 Worth St., New York 13, N. Y. • Atlanta • Boston • Chicago • Dallas • Detroit • Los Angeles • Philadelphia • San Francisco • St. Louis

IDEA of the CENTURY

In the past hundred years, the one revolutionary idea in threaded fasteners was pioneered by Parker-Kalon . . . hardened Self-tapping Screws.

They offered simplicity, speed, and security for fastenings to metals, plastics, laminates, — savings impossible with conventional methods. They inspired the modern assembly techniques essential to mass production. Their contribution to cost reduction mounts by millions every year.

For almost any assembly, there's a big potential saving with Self-tapping Screws. But the promise can fade in production if screw failure snarls up the line. That's why quality standards for P-K Self-tapping Screws were set so high to begin with, and are still harder to match today.

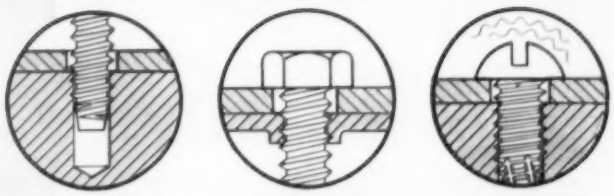
Only Parker-Kalon can offer P-K quality, the indispensable extra, along with the proved advantages of Self-tapping Screws.

Only Parker-Kalon can offer P-K experience — covering many more years and millions more applications than any comparable record.

Plan your assemblies for lowest cost . . . a P-K Assembly Engineer will help you. Then make sure *planned* savings keep on *paying off* . . . when you purchase, order "P-K". Parker-Kalon Division, General American Transportation Corporation, 200 Varick St., New York 14.

The First originated by P-K . . . and *first* today . . . the leading choice for fastening economy

SELF-TAPPING SCREWS



. . DRIVE RIGHT . . . SEAT RIGHT . . . STAY TIGHT . . . **P-K** means **OK**

NOW YOU CAN GET NRM

20:1 L_e/D RATIO

Thermoplastic EXTRUDERS

NRM 4½" Model 55
Electrically Heated Extruder

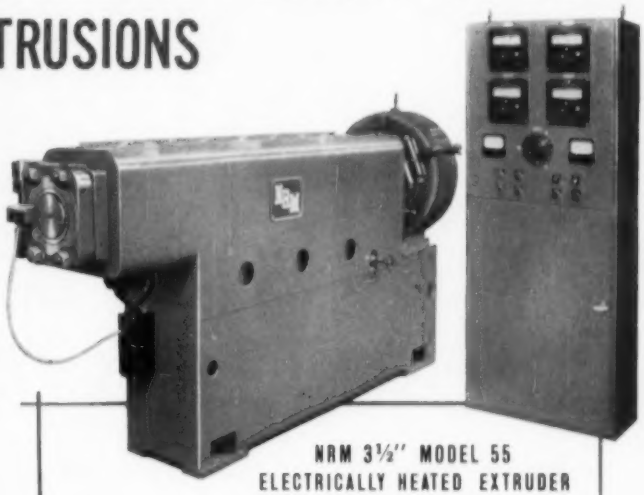
ALL IN SIZES . . .

TO GIVE YOU *More* EXTRUSION POUNDS PER HOUR . . . *finer* QUALITY EXTRUSIONS

20:1 Le/D cylinder ratios, the most significant advancement in plastics extruder development in many years, is now a standard feature of NRM Model 55 Extruders, and may be obtained in all cylinder sizes.

With effective cylinder and screw lengths twenty times their diameter (measured from feed opening to die), Model 55 Extruders provide, among other things, more thorough heating, combined with greater mechanical working of the plastic as it travels a longer path to the die. Whatever the extruder size may be, the physical characteristics developed in the plastic under these conditions result in extrusions of finer finish and shape-holding quality, produced with less waste and at 30 to 50% faster than with conventional machines of the same size.

To plastic manufacturers and processors, Model 55 Extruders offer the opportunity to excel in both the *quality* of their work, and in the ratio of *profit* realized from the work. Model 55's have all the traditional NRM advantages the plastics industry has long relied upon for most efficient extrusion — Balanced Heat Control . . . Quick-Opening Die Gates . . . Torpedo-Type Screws and others — PLUS the new 20:1 Cylinder development. Write for more details and information. See why NRM Model 55 Extruders will fit more compactly into your production system, and produce more top quality extrusion-pounds per hour than you've ever experienced with conventional machines.



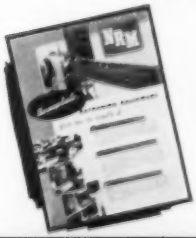
NRM 3½" MODEL 55
ELECTRICALLY HEATED EXTRUDER

NOMINAL CAPACITY: 160-230 lbs./hr.
SCREW SPEED: Minimum range, 12-73 rpm
DRIVE: 25 hp—REDUCTION UNIT: Herringbone Gear, 24.5:1 Ratio
FLOOR SPACE: Extruder—112" long x 36" wide
Control Cabinet—19½" deep x 28" wide

NRM 3½" ELECTRICALLY HEATED DEVOLATILIZING EXTRUDER
(24:1 Le/D RATIO)

Where devolatilization is required, NRM supplies Extruders with venting arrangement built integral with the cylinder. These machines not only remove moisture without use of unwieldy pre-drying attachments, but eliminate porosity in extrusions by removing other volatile constituents whose boiling point is reached inside the machine.

DATA ON MODEL 55 EXTRUDERS AND MATCHED ACCESSORIES IS CONTAINED IN OUR LATEST SPECIFICATION BOOKLET



WRITE FOR IT TODAY!

2455

NRM

NATIONAL RUBBER MACHINERY CO.

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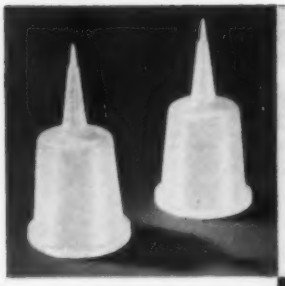
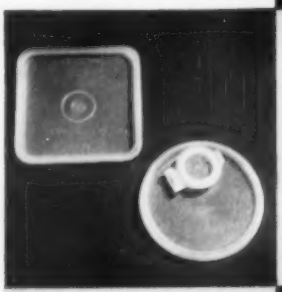
WEST—S. M. Kaye, Box 441, Pasadena 18, Cal.—SYcamore 4-2110
EXPORT: Omni Products Corporation, 460 Fourth Ave., New York, N. Y.—LExington 2-1320

GET "20:1 QUALITY AND PERFORMANCE" WITH NRM 20:1 Le/D EXTRUDERS



NOBODY HAS AS MUCH EXPERIENCE AT MOLDING POLYETHYLENE AS TUPPER!



Tupper Seals are air and liquid-tight flexible covers. The famous Pour All and Per Top covers are designed for easy dispensing. They are made in sizes to fit all Tupperware containers.

The logical molder for you to consult regarding that product or package of yours which is to be made of polyethylene is Tupper. Tupper has done more than any other molder to make molded polyethylene a practical reality.

Aside from having designed, patented, and promoted successful seals, closures, and dispensers for polyethylene containers, the Tupper Corporation has vast experience in *every phase* of polyethylene packaging and polyethylene injection molding. This experience will be of major importance in improving your product, in reducing your costs, when Tupper goes to work for you.

Tupper's combination of experience, technical ingenuity, and the most modern equipment is at your service for the custom molding of your product in polyethylene. You can do no better than the best ... and the best at molding polyethylene is Tupper!

When equipped with Tupper Seals, Tupper Canisters, Sauce Dishes, Wonder Bowls, Cereal Bowls and Funnels in various sizes are the most versatile reusable containers you have ever seen.

TUPPER!
TRADE MARK

TUPPER PRODUCTS ARE FULLY PROTECTED

About 150 United States and foreign patents and patents applied for, plus numerous trademarks and copyrights, cover the design and manufacture of the various types of Tupper Seals and other Tupper Products. Unauthorized manufacture of items covered by Tupper patents will subject infringers to prosecution.

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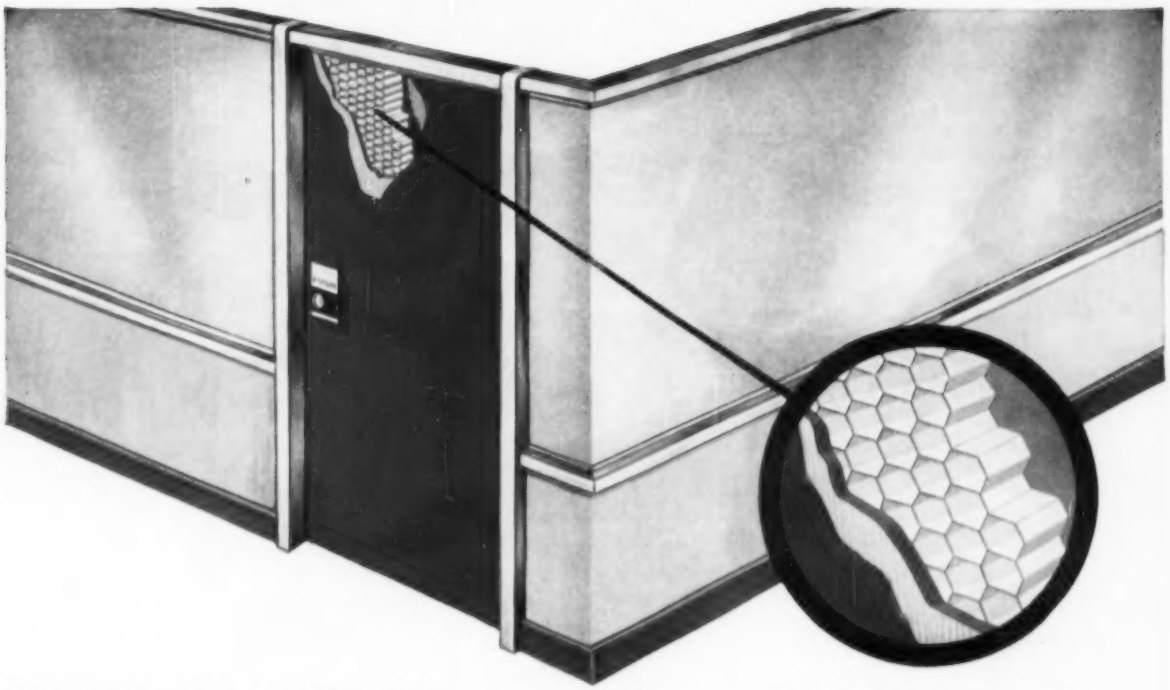


Marvinol vinyl's beauty and practicality now in...

the honeycombed Kawneer door vinyl-laminated by the Marvibond process

Your doors are usually the visual focal point of inquiring visitors, and at the same time, the gateways through which they must pass—opening and closing, pushing and pulling. Because of this, Kawneer* now adds the beauty and practicality of Marvinol® vinyl to its functional triple-strength door. The vinyl is permanently bonded to the metal by the MARVIBOND† process, Naugatuck's exclusive technique for laminating vinyl to most metals.

Marvibonded metals offer the full, rich colors of vinyl in practically any surface effect—smooth or matte finishes, leather-like grains, marble patterns, prints, weaves, or other embossed finishes. And the Marvibond process adds to the strength, rigidity, and formability of metal, the abrasion resistance, chemical resistance, and weather resistance of vinyl... Marvinol vinyl which will not chip, scratch, or peel... nor support combustion. And, scuff-marks, fingerprints, and stains wipe off with a damp cloth.

Marvibonded metals are now being produced on a continuous production basis. Laminated before forming, they can be fabricated by all standard metal working tools—even deepdrawn without fracture or loss of adhesive bond.

If you are using sheet metals that have to be finished, or that would have added sales value if they were, why not investigate what Marvibond has to offer? **For samples, technical data, and the location of licensed laminators, please write to us on your company letterhead.**

†Patent applied for

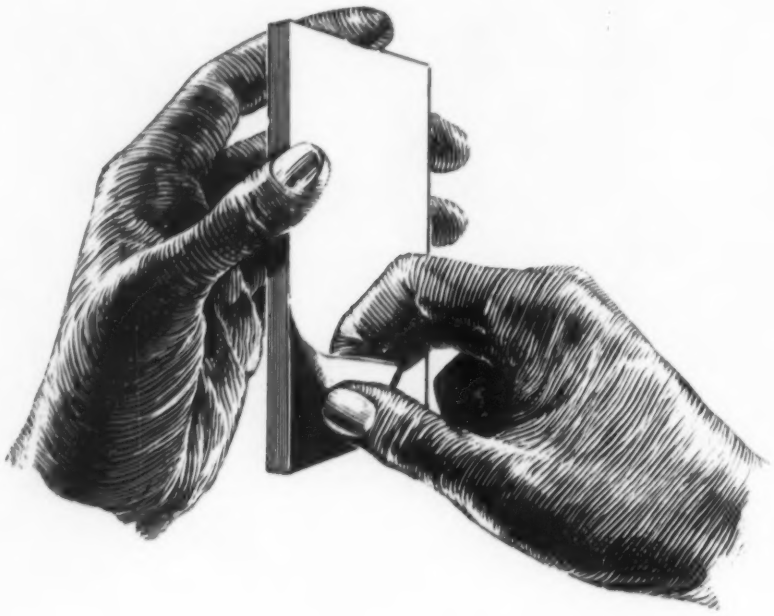
*Kawneer Company, Architectural Products Division, Niles, Michigan

Naugatuck Chemical

Division of United States Rubber Company

Naugatuck, Connecticut

BRANCHES: Akron • Boston • Gastonia, N.C. • Chicago • Los Angeles • Memphis • New York • Philadelphia • IN CANADA: Naugatuck Chemicals, Elmira, Ontario
Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N.Y.



hands you never see
give *your pressure sensitive cement* the test that really counts

Got a product that requires mechanical or adhesive installations or applications? Then by all means explore the possibilities of new *pressure sensitive cements!* But remember this:

Hands you never see . . . the hands of the eventual product user . . . give your pressure sensitive cement the test that really counts. So look for *experience* with this new adhesive medium . . . experience that goes beyond the laboratory into the field of use.

As adhesive manufacturers for over 20 years, and pioneers in the pressure sensitive field, we already have some unusual success stories to tell. Let's talk about how they might be applied to your product.

Call or write Dept. A at the nearest Angier Plant for personal attention. We will help you define your problem as well as solve it. Inquiring will not obligate you in any way.

FOR EVERY INDUSTRY

Latest Developments in Pressure Sensitive Cements

ANGIER PRODUCTS INC.

Rubber, Latex and Resin Cements
Laminants and Sealants
Tie Coats
Resin Emulsions

Angier Products

120 POTTER STREET, CAMBRIDGE 42, MASS.

Midwestern Plant: Huntington, Indiana

It doesn't COST to own an ELMES molding press...

Elmes Hydrolairs® with Continuous Power Stroke

Most economical of all power presses to buy and use. No pumps or motors. Powered by shop compressed air line. Hydrolairs deliver selected pressure and maintain that pressure, even on compressible materials. Standard 50-ton Floor Model with either lever or (illustrated) electrical control, and 30-ton Bench and Floor Models with lever control.

Elmes® plastics molding equipment, backed by over a solid century of engineering experience, is convenient and simple to use . . . fast, flexible, and economical to operate. An investment in Elmes hydraulic equipment pays big dividends in quality and speed of output. For all kinds of press applications you can count on Elmes for performance that turns cost figures into profit figures.

Elmes offers a complete line of *standard* equipment, including compression and transfer presses; Hydrolairs® — power presses requiring neither pumps nor motors; small-production, laminating, and laboratory presses; and Elmes pump-accumulator systems for group press operation. Or your requirements may call for *special* designs, in which case Elmes engineers can develop custom-built equipment to exactly suit your particular needs.

For detailed information contact your Elmes distributor, or write to us direct.

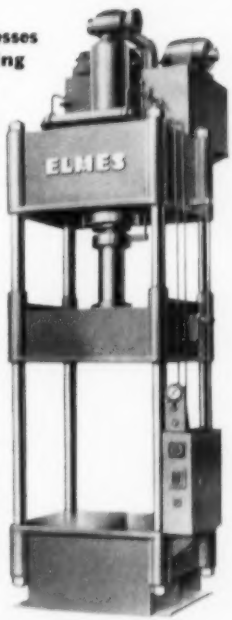
Compression and Transfer Molding Presses

Press changes from straight compression to transfer molding by flicking a switch. In the compression cycle, the circuit provides two selective breathing periods. Opening during breathing can be controlled to suit each specific application. Curing cycle is set by motor-type timer. Pump has compensating control, so that during curing cycle only essential minimum horsepower is used. Available in 50 to 1000-ton capacities, or larger tonnages where required.

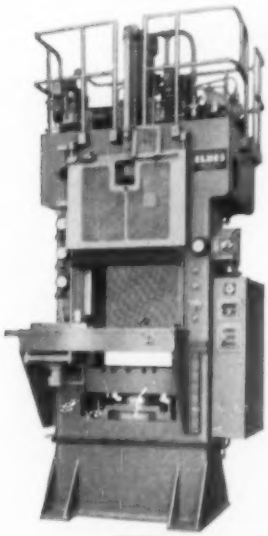
It PAYS!...

New... Complete Line of Presses for Reinforced Plastics Molding

This newly-developed line of Elmes Presses is made in standard capacities from 50 to 300 tons. Larger tonnage presses can be built to suit special requirements.



At right— 100-ton Press for Reinforced Plastics Molding



Are Your Requirements Special?

There are times when a standard press won't do. An example is the Elmes custom-built 200-ton Transfer Molding press shown at left. If your requirements call for a press newly-designed for you, a modification of an existing standard design — Elmes background, facilities and foresight can save you dollars and assure you press performance at its best.

All Elmes Presses for Reinforced Plastics Molding are fully pushbutton controlled. Press equipped with rapid advance and return, and adjustable slow pressing and breakaway. Adjustable timer can be pre-set for any length of cure cycle desired. Complete specifications furnished promptly on request.

AMERICAN STEEL FOUNDRIES

ELMES ENGINEERING DIVISION

hydraulic presses and equipment ....1159 TENNESSEE AVE., CINCINNATI 29, OHIO

PLASTIC BOXES
by the Millions
with Dies of BTR

This die, made of BTR (Bethlehem Tool Room) tool steel, is typical of the dies used by Hake Manufacturing Co., Inc., Roanoke, Va., makers of plastic boxes. The die is used in injection molding of plastic parts of polystyrene. BTR is used for the die-cavity, cores and runners.

The die is hardened to Rockwell C 56-58. The cores and cavities in the molds are highly polished to a rich, mirror-like finish, so as to provide a smooth, glossy surface on the finished product.

BTR is our general-purpose, manganese-chromium-tungsten grade of oil-hardening tool steel. It is an economical steel for plastic-molding operations because it is easy to machine, and has a long service life. And not only is BTR capable of being polished to a high surface lustre, it also retains this lustre indefinitely, ensuring volume production of a highly acceptable product.

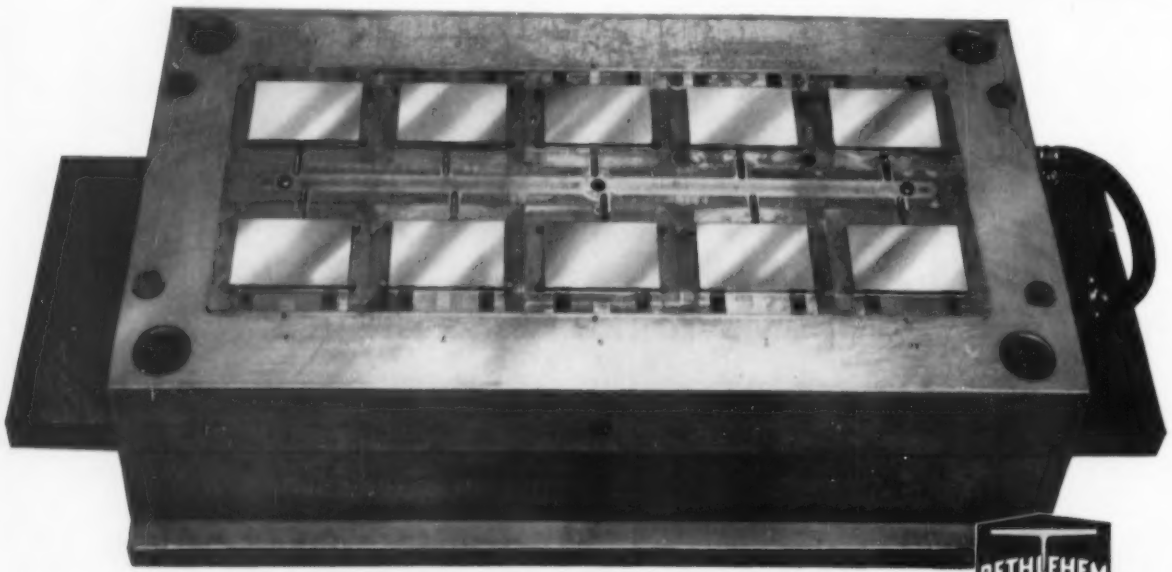
TYPICAL ANALYSIS

Carbon 0.90 Chromium 0.50 Manganese 1.20
Vanadium 0.20 Tungsten 0.50

To place a trial order for BTR, or for additional information about this fine tool steel, just call your tool-steel distributor, or write to the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation



BETHLEHEM TOOL STEELS

BETHLEHEM STEEL

Stabilized with Lectro "60", vinyl insulations pass immersion tests with flying colors.

Now "Dutch Boy" research brings you

Lectro "60"

unique stabilizer for vinyl insulation

- **Disperses with ease!**
- **Excellent electrical properties!**
- **Reduces volume cost!**
- **Repels water!**

Now it's here . . . in full production . . . a brand new lead complex. "Dutch Boy" Lectro "60".

Outstanding for water repellency. "Dutch Boy" Lectro "60" is insoluble and completely non-absorptive . . . actively repels water penetration. Prevents porosity. What's more, it demonstrates excellent volume resistivity over a wide range of temperatures. When TW and comparable vinyl insulations are stabilized with *Lectro "60"*, they pass immersion tests with flying colors.

Great ease of dispersion. "Dutch Boy" Lectro "60" resists penetration by water but welcomes plasticizer wetting – shows remarkable ease of dispersion. In vinyl insulation compounds, it shows excellent extrusion properties . . . no moisture pick up . . . no gassing. And with most plasticizers it is non-reactive. Excellent compatibility.

Low volume cost. "Dutch Boy" Lectro "60" has much lower specific gravity than other primary basic lead stabilizers.

You get "Dutch Boy" Lectro "60" commercially as a fine white powder in 50-lb. bags. But for sampling purposes the carton shown is packed with 1½-lbs. If you would like one of these free sample packages, just write.

For free sample – write:

Dutch Boy® CHEMICALS

NATIONAL LEAD COMPANY
111 Broadway, New York 6, N. Y.
In Canada: CANADIAN TITANIUM PIGMENTS LIMITED
630 Dorchester Street, West · Montreal

Trims and Pierces Vacuum-Formed Plastics

Dake Hydraulic Presses are designed to manufacturer's specifications with large area, low tonnage, and plenty of "daylight."

When Kent Plastics Corporation, Evansville, Ind., decided to manufacture vacuum-formed plastics, they wanted efficient equipment both for forming and for trimming and piercing products made from high-impact polystyrene sheet.

Since Dake Plastics Molding Presses are widely known and used in the industry, Kent engineers turned to Dake for assistance. Dake engineers were glad to co-operate in developing a trimming and piercing press with over-all size, bed area, tonnage, stroke, and speeds (both advance and pressing) suited to Kent's requirements. The first press proved so satisfactory in operation that a second one (with slightly different specifications) has now been built and installed.

Dake will gladly work with you to provide a trimming and piercing press exactly suited to your needs. For descriptive literature on these presses, write for Bulletin 352.

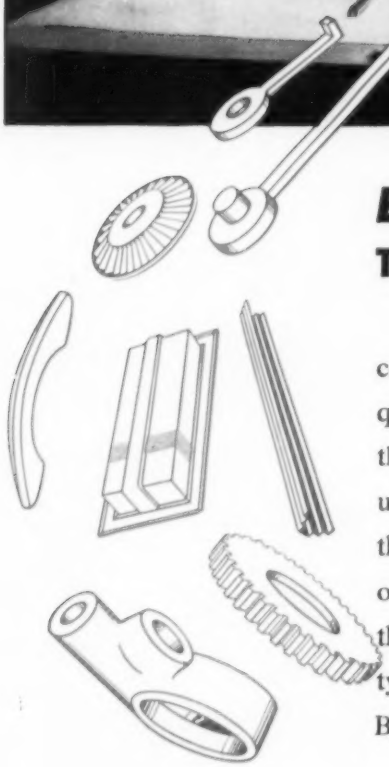
Dake Plastic Trimming Press with a refrigerator inner door liner in position for piercing and trimming. Workman is about to lower the platen.

Workman at Kent Plastics Corp. prepares the second Dake Press to receive a die. Original press is in operation at left.

DAKE CORPORATION, 648 Seventh St., Grand Haven, Mich.

DAKE PRESSES

Arbor Presses · Hand-Operated Hydraulic · Power-Operated Hydraulic · Guided Platen · Gap Type Presses · Movable Frame



ENGINEERING . . .

The Basis of QUINN-BERRY Service

When you consult Quinn-Berry for molded plastics, a competent, experienced engineering staff tackles your requirements right in the planning or blueprint stage. From that point to the finished product, your molded plastics are under the supervision of these Q-B engineers every step of the way. And these steps include precision mold-building in our own machine shops by some of the finest craftsmen in the country, skilled production on modern presses, and any type of finishing required. Thus, in molded plastics, Quinn-Berry offers a complete service with undivided responsibility.

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QUINN-BERRY CORP.

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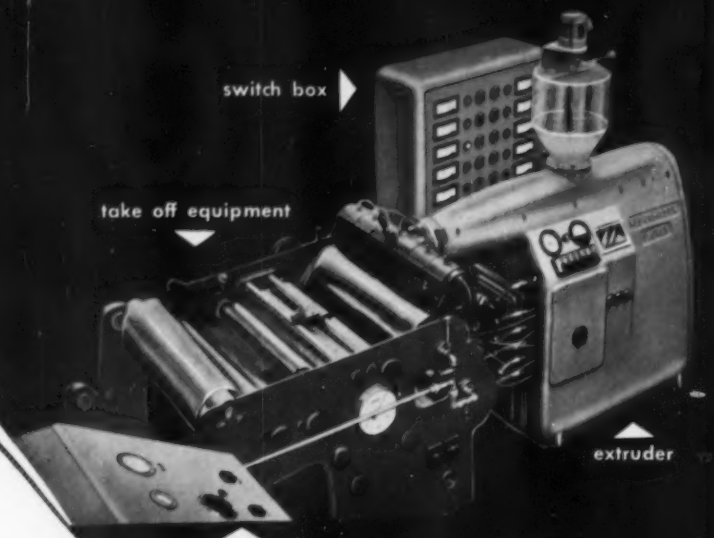
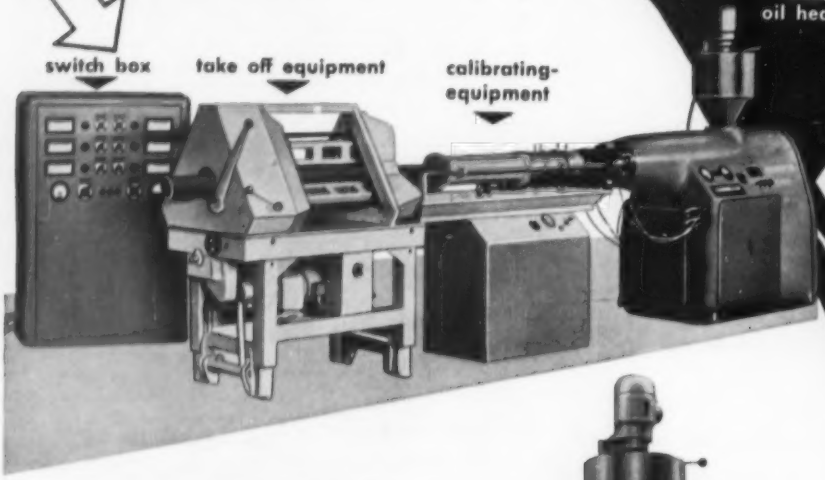
PLASTICS

MOLDERS OF ALL TYPES OF THERMOPLASTIC MATERIALS

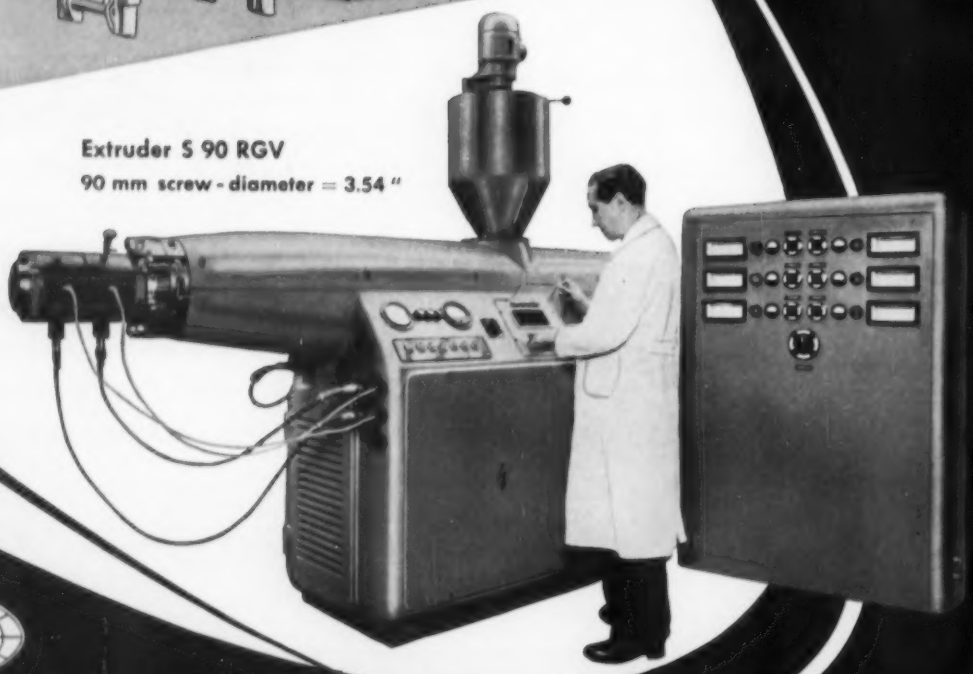
Complete Plants for Extrusion

tubes, sheets and films





Extruder S 90 RGV
90 mm screw-diameter = 3.54 "



BOPP

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MASCHINENFABRIK
TROISDORF • WEST GERMANY

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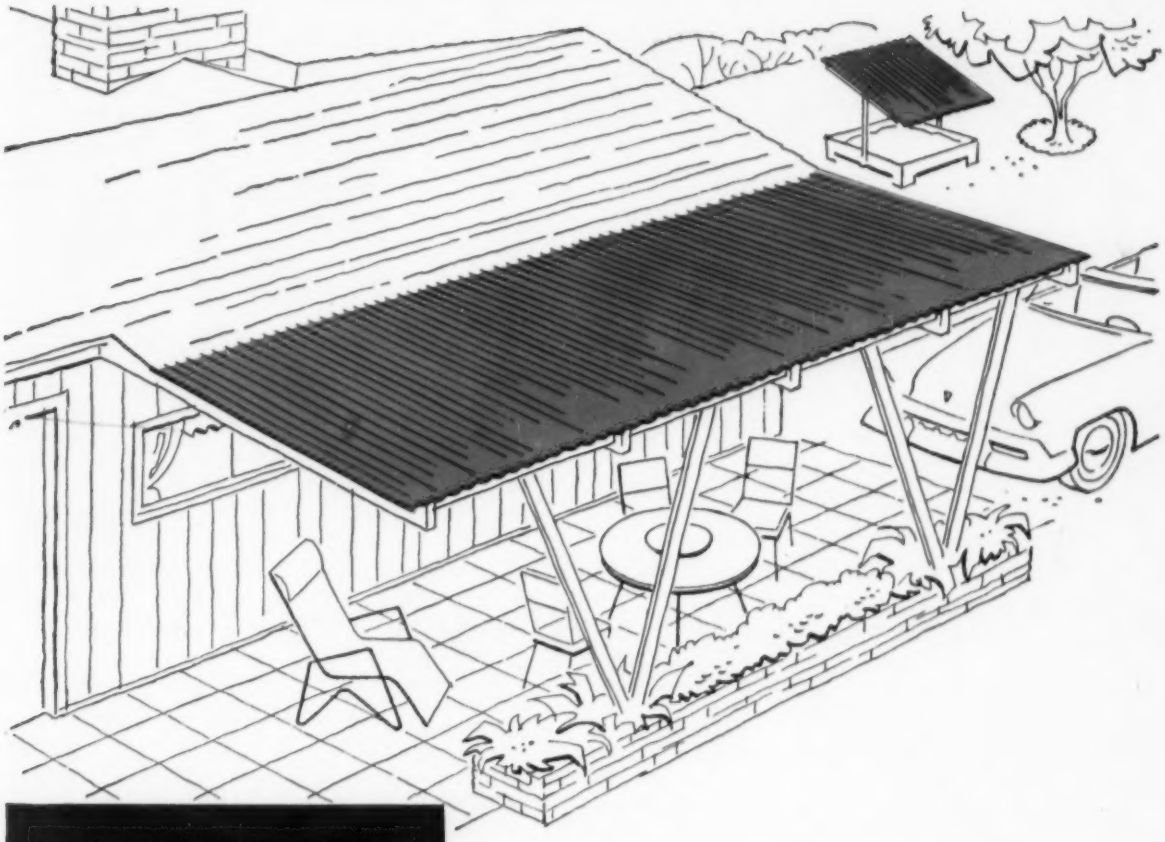

GLIDPOL*

pigmented polyester resins for maximum light stability and superior corrosion resistance

These colorful carport panels are laminated and oven-cured at room temperature by Temrock, Inc., Barrington, Ill., with pigmented GLIDPOL resins. They offer top resistance to sun-fading, weathering and chemical action.

Like Temrock, you can probably find the answer to your molding, casting, lamjnating or coating application in the versatile family of GLIDPOL resins . . . GLIDPOL provides superior wetting, easy layup and rapid cure at room or elevated temperature without cracking or crazing.

GLIDPOL polyester resins are custom-formulated to meet specific product requirements: high dielectric strength, impact and structural strength, dimensional stability, water absorption, flexibility and surface quality.

Glidden Quality Control is your assurance of resin uniformity between batch deliveries. Our complete Technical Service makes it easy for you to switch to GLIDPOL without interrupting production.

*A Glidden Trade Mark

A request on your company letterhead will bring you a copy of Technical Bulletin MP-1055 which fully describes all of the Glidden GLIDPOL resins for casting, laminating, molding and coating.

GLIDPOL
POLYESTER RESINS

QUALITY Glidden PRODUCTS

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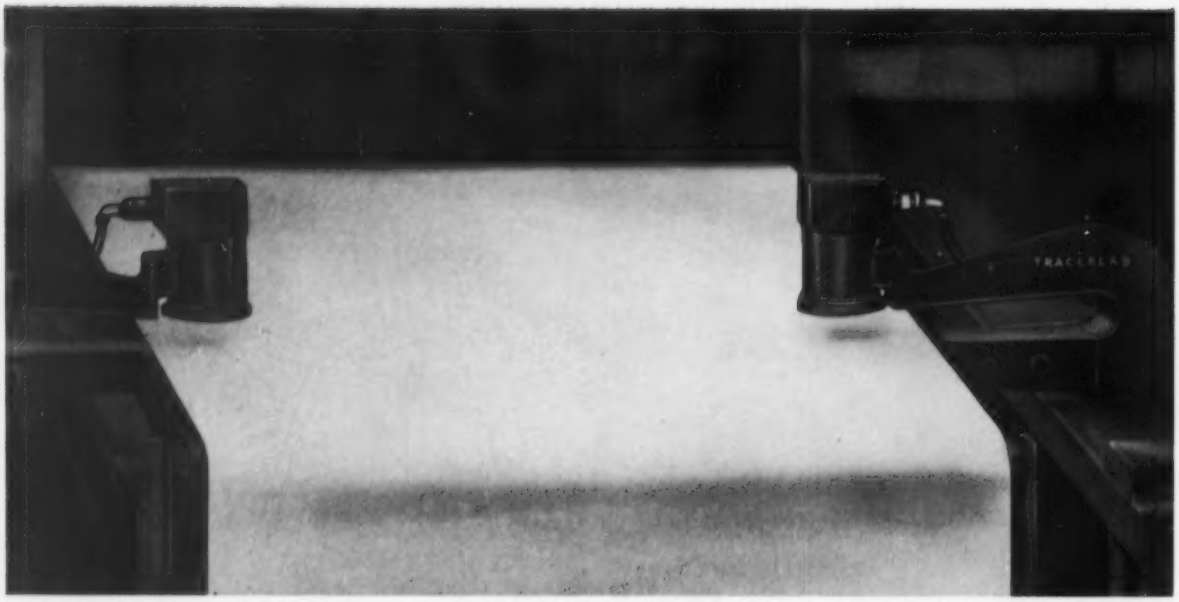


HOW NUCLEAR ENERGY PAYS OFF

for Gordon-Lacey Chemical Products Co. Inc.

by **ROBERT GORDON**

Director of Research and Process
Gordon-Lacey Chemical Products Co. Inc.

Gordon-Lacey Chemical Products Co. Inc. can assure its customers of top quality plain and embossed plastic film, because it had the foresight to explore the possibility of using nuclear energy for this purpose. It was the first plastics company to employ Tracerlab Beta Gauges three years ago.

And Gordon-Lacey benefits, too. Rejects and losses due to "off gauge" production have been virtually eliminated, supervision is minimized, and hand-gauging is not necessary at the machine. As a result, it is estimated that the Beta Gauging equipment will amortize its cost in about 2 years' time.

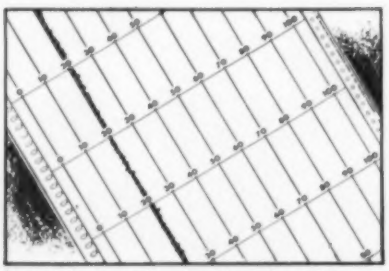
Before the Beta Gauges were installed, the calender operator set up the rolls by cutting a hot swatch of plastic directly off the calender roll and made roll adjustments until in his opinion, the position of the rolls were at the required gauge. The run was then started and strips cut from the finished roll, for hand gauging. Further roll adjustments were made and this cut and try procedure repeated until the thickness came within tolerance. Once a run got underway, the operator hand gauged the edges of the film several times before the roll of film was completed, to catch "drift" away from tolerance.

Every time a new run was started, this laborious procedure was repeated. And because of the personal element involved in hand gauging, uniformity of production from roll to roll and from day to day was difficult to achieve. On embossed goods, it was impossible to separate fact from opinion concerning thickness.

Now, paired Tracerlab Beta Gauges scan each edge of the film continuously and transmit readings to a remotely mounted meter, in view of the operator, which instantly indicates drift away from specified thickness. This permits the operator to make adjustments "on the fly" and minimizes "off gauge" production. On starting up the operator simply sets the desired thickness using the Beta Gauge meters, and makes minor corrections while the goods roll. Pen recorders continuously provide a permanent, unassailable record of the gauge scanning for each roll.

On embossed goods, Beta Gauging provides the first accurate, satisfactory method of measuring thickness.

If you have a problem that involves control of thickness or weight per unit area, Tracerlab will be glad to show you the advantages of Beta Gauging ***. . . another modern application of nuclear energy.***



Typical chart recording shows how sheet thickness is kept within close limits by Tracerlab Beta Gauges. Chart forms a continuous, permanent record of production. Installation amortizes in about two years' time.

Control panel gives visual indication of thickness for operator to observe. Drift away from spec can be quickly corrected without loss of time or production. Rejects due to "off gauge" production have been virtually eliminated.

14-ft. boat hull molded from Bigelow's FORMAT by Winner Manufacturing Company, Inc., Trenton, N. J., using pressure bag method.

BIGELOW
Fiber Glass Products

"Form-Fitting" Fiber Glass Mat Makes Better Boat Hulls Faster!

BIGELOW'S WIDE FORMAT* ELIMINATES MULTIPLE LAYERS AND LAMINATIONS, CUTS PATTERN COSTS

There are four important reasons why leading manufacturers of boat hulls select FORMAT:

1. **It *"form-fits"*** your mold because of its uniformity and drapeability . . . fills in curves and crevices . . . greatly reduces notching and slitting.
2. **It's the *widest*** glass mat in the industry . . 84 inches! That makes it possible to lay down an entire hull in one longitudinal operation . . . eliminates tedious cross-width methods.
3. **It's the *heaviest*** fiber glass mat on the market . . . available up to 10-oz. per-sq.-ft. weight . . . more than three times the weight of other mats. This cuts time, labor and pattern costs by eliminating multiple layers!
4. **It's *mechanically bound* . . .** a FORMAT *exclusive* that gives you a mat uncontaminated by chemicals that might cause discoloration or blistering in processing!

*A Bigelow Trademark

BIGELOW Fiber Glass

can solve *your* Production Problems!

An engineering staff with an outstanding record of achievement is at your service. Let them show you how the complete line of Bigelow glass reinforcing materials can do a better job at lower cost for you!

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BIGELOW FIBER GLASS PRODUCTS
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Please send complete information on Bigelow Fiber Glass Products.

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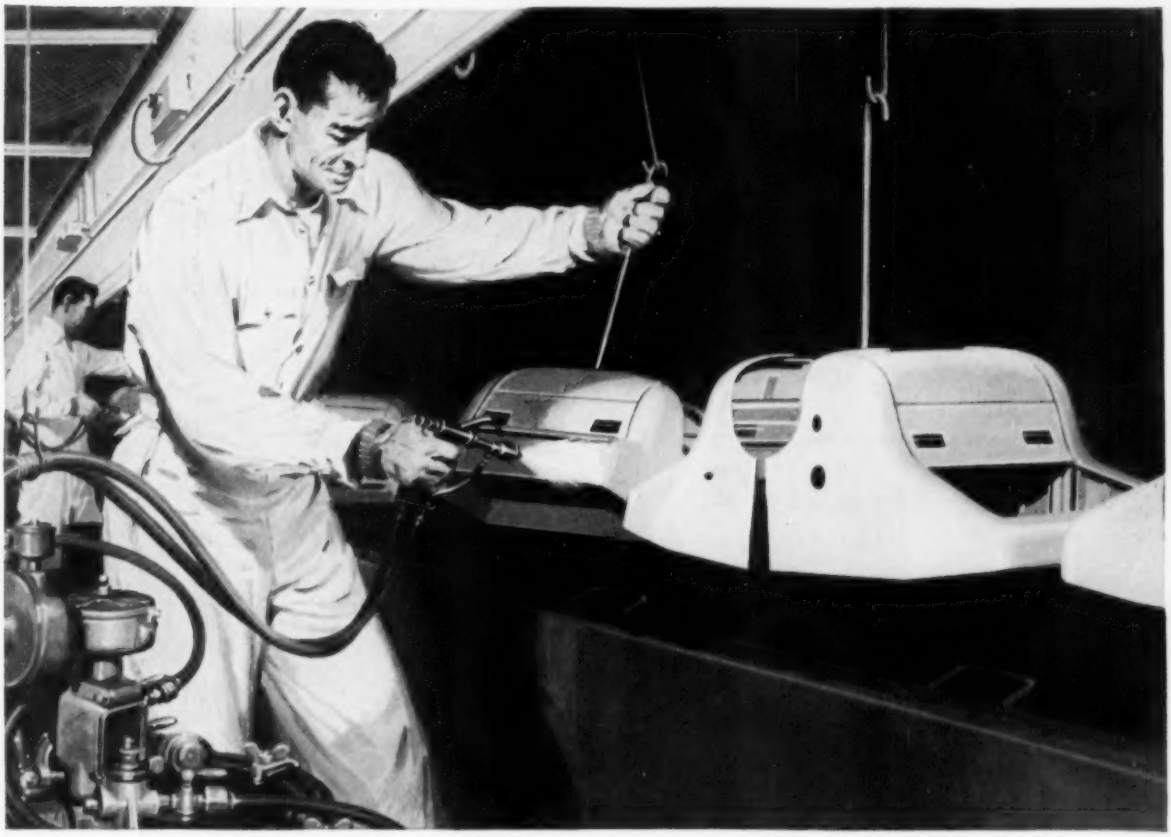
EXON: each resin engineered for a specific problem

EXON 470

specifically for

PROTECTIVE COATINGS



With excellent adhesion to a wide variety of surfaces, plus unusual compatibility characteristics, EXON 470 can significantly increase the versatility and improve the performance of any protective coating.

EXON 470 combines the best properties of many resins used in this field. This enables you to use one resin instead of a combination of several, with greater-than-ever efficiency, production economy, and simplified inventory.

EXON 470 combines excellent water, grease and chemical resistance with stability to heat and light, and unusual resistance to weather and abrasion. This resin demonstrates once again how likely you are to find the specific remedy for your specific problem—in the growing family of Firestone Exon resins.

Firestone

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For complete information or technical service on the entire line of EXON *resins, call or write today.*

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DIVISION OF FIRESTONE TIRE & RUBBER CO.

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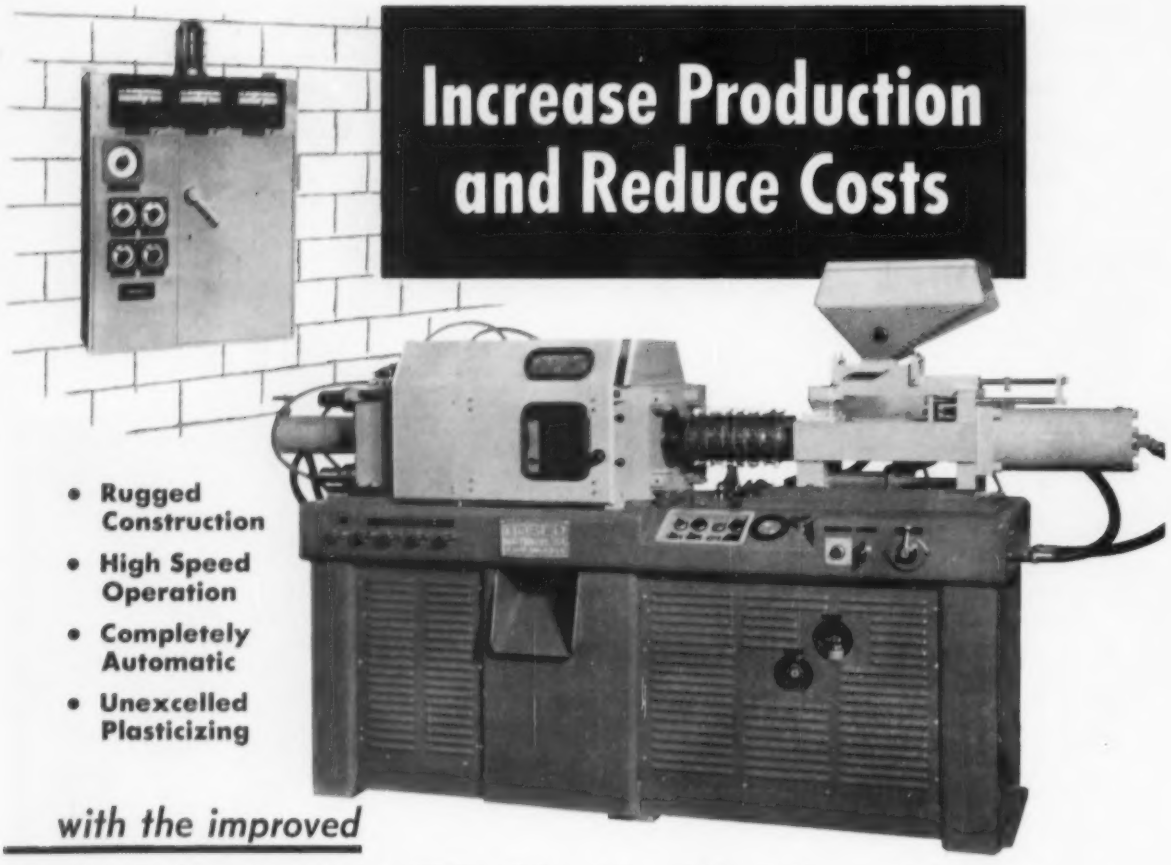

- Rugged Construction
- High Speed Operation
- Completely Automatic
- Unexcelled Plasticizing

with the improved

Moslo Model 75 Plastic Molding Machine

Here's the last word in injection plastic molding machines. The molding machine of tomorrow—here today.

The Moslo Model 75 is a high-speed, 3 ounce unit that plasticizes material at the rate of 70 lbs. per hour and is capable of 750 cycles per hour—(dry run). Its amazing performance will out produce machines of 2 to 4 times its capacity.

With this high production rate, plus a modest initial investment and low mold costs, the Model 75 is a real profit builder that has no equal.

In addition, the 75 is a terrific machine in every other way. Built like the "Rock of Gibraltar", it will stand the gaff of continuous operation. The most modern safety devices and automatic controls assure you of dependable service and maximum protection to the operator, material and machine.

Actually words and pictures hardly tell the story. The best way to convince yourself of the merits of the Moslo Model 75 is to see it perform. We invite you to visit our plant and we will gladly make a demonstration using your molds. Seven out of ten who have seen a demonstration in our plant have placed an order for a Moslo machine.

Look at these features

• Plasticizing capacity	70 lbs. per hour
• Cycles per hour—dry run	750
• Maximum injection pressure	20,000 p.s.i.
• Mold opening	8 inches
• Mold size	11⅞ inches x 15 inches
• Mold thickness—minimum	8 inches
• Mold thickness—maximum	13 inches
• Mold locking force	145 tons

East Coast Representative
Mr. B. J. Moslo
164 Nassau
Princeton, N. J.

West Coast Representative
West Coast Plastics
8510 Warner Road
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MOSLO MACHINERY COMPANY
2437 PROSPECT AVENUE • CLEVELAND 15, OHIO

Glass reinforced polyester chair manufactured by the Selig Chair Company. Shell is molded by the Prolon Plastics Division of Pro-phy-lac-tic Company.

Why this chair is made with PARAPLEX P-47

The shell of this smartly-designed modern chair is molded of glass fibers and PARAPLEX P-47 polyester resin. Chair manufacturer and customers alike are pleased with the strength, durability, and beauty which PARAPLEX P-47 provides. The molder of the shell is impressed with the resin's working advantages.

PARAPLEX P-47, when cured, is rigid and tough, yet flexible enough so that squealing does not occur upon flexure. The resin releases readily from hot molds, has high strength and rigidity at elevated temperatures, and has good resistance to cracking and crazing—even in resin-rich areas. Other advantages are fast curing speed and low specific gravity, both of which can mean appreciable cost savings.

For more information on PARAPLEX P-47, and other PARAPLEX resins as well, write Department WW-155.

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Representatives in principal foreign countries

PARAPLEX is a trade-mark, Reg. U.S. Pat. Off. and in principal foreign countries.

NEWS FLASH!

Close-fitting microphone parts molded with

DYLENE* POLYSTYRENE

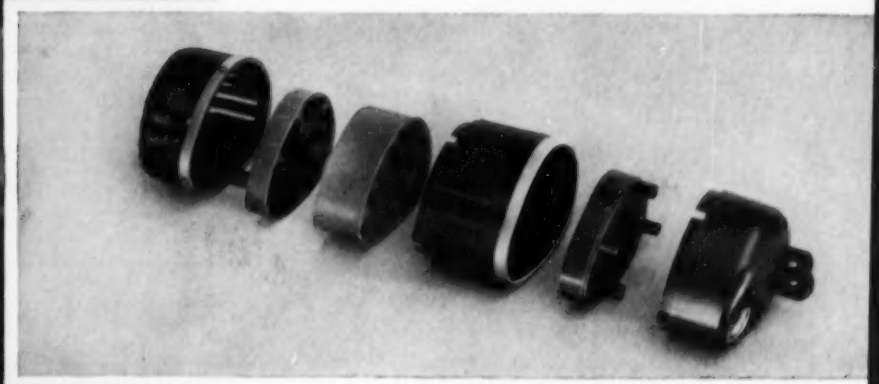
Here's precision molding! This microphone is comprised of 6 individually molded parts that fit together in a tight assembly. The design is detailed and the tolerances are small. Dylene high-impact polystyrene filled every corner of the mold, and the result is 6 precisely finished pieces that slip easily and firmly together. The assembled microphone is smooth, lightweight, tough, and handsomely molded in gunmetal gray.

Koppers makes Dylene polystyrene formulations to meet every design requirement. Some are particularly suited for large moldings. Others have special features such as extra rigidity and strength, or high heat resistance. No matter what you produce—toys, appliances, electronic parts or housewares—there is a Dylene formulation that will help improve your product or reduce production costs. And Koppers application engineers are always ready to help you select the Dylene formulation that is right for you.

For more information, call your local Koppers Sales Office, or write to Koppers Company, Inc., Chemical Division, Dept. MP-105, Pittsburgh 19, Pennsylvania.

*Koppers Trademark

Molder: **Post Manufacturing Corp., Norwalk, California.**
Manufacturer: **Altec-Lansing Corp., Los Angeles, California.**



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R/M DEVELOPS CUSHIONED GLASS FIBER WARP FOR USE IN WOUND STRUCTURES

Novabestos Cushioned Glass Fiber Warp is a new construction offered by R/M for such structures as rocket launchers and Jato. It is an evenly spaced warp of 150-1/0 glass yarn sandwiched between 4 mil thick cushion layers of asbestos fiber paper—and fully bonded with B stage polyester or epoxy resin. Flexible, tough and slightly tacky, it can be easily and safely handled as a sheet or tape. Its crosswise stretch allows curvature conformation. When laminated at 15-50 psi, a highly directional solid reinforced structure of unusual properties is obtained:

tensile strength	**48,000 psi**
tensile modulus	**6.4 x 10^6 psi**
flexural strength	**81,500 psi**
columnar compression	**49,600 psi**

Write on your company letterhead for a free copy of a brochure containing technical and design data on R/M's unique line of Novabestos Papers, Pyrotex Felts, and Asbestos Cloths.

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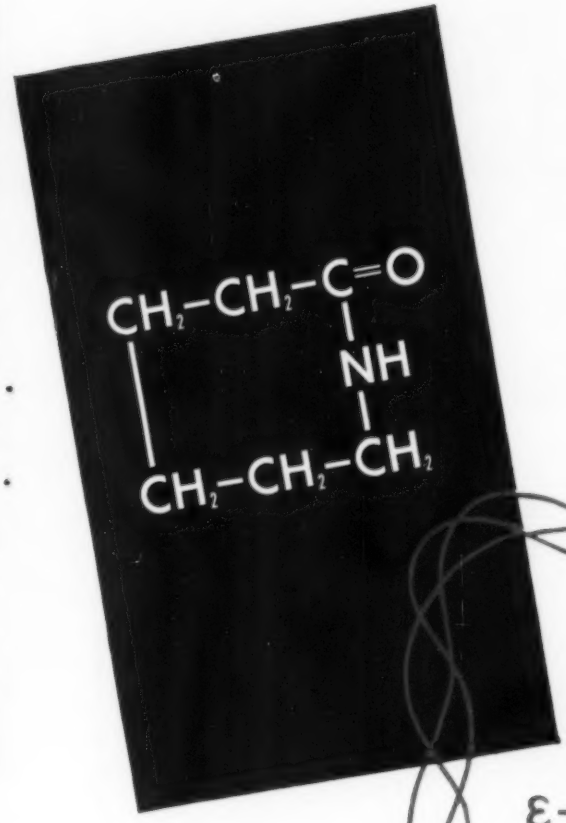


National Aniline Announces

First American Tonnage Production

of an interesting reactive intermediate

NATIONAL®

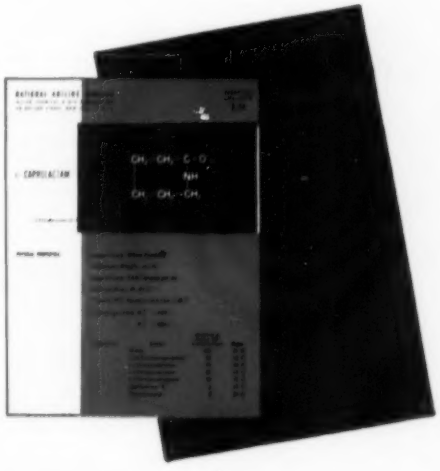
ε-CAPROLACTAM

(2-Oxohexamethylenimine)

Available for the first time in large tonnage, this high-purity ε-Caprolactam should find important uses in new organic chemical developments. Our modern Hopewell, Va. plant has ample production to supply projected requirements and our output can be further expanded to meet any foreseeable commercial need at attractive volume prices.

WRITE FOR TECHNICAL BULLETIN I-14

To assist prospective users of this unusual 6-carbon chemical, National CAPROLACTAM, we have prepared a 12-page brochure containing complete physical properties, known chemical reactions, suggested uses, and a bibliography. Samples and additional technical help are freely available to those whose work may develop new uses for National CAPROLACTAM.



NATIONAL ANILINE DIVISION

ALLIED CHEMICAL & DYE CORPORATION

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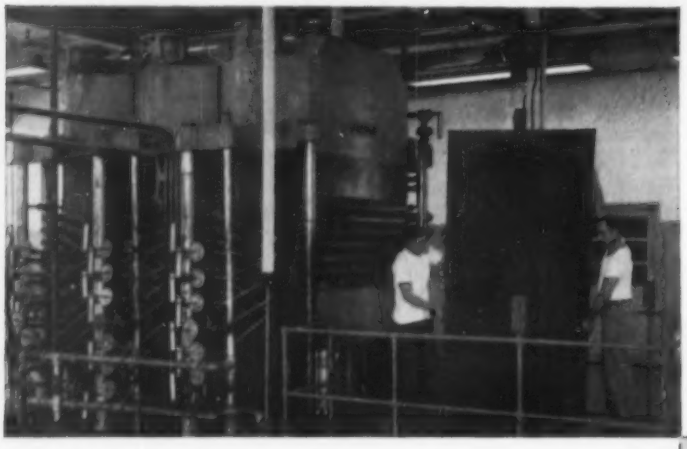
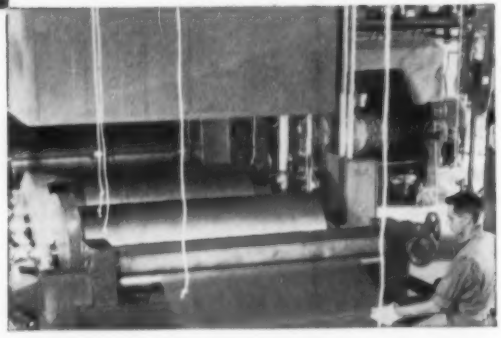
A QUALITY LINE OF RIGID PLASTIC SHEETS



LAMINATING in this giant press produces SEILON SHEETS with thicknesses of 1/16" through 1". Other gauges are available on request. Sheets can be produced flat or corrugated, as desired.

CALENDERING rolls SEILON in sheet thicknesses of .005 through .025. Heavier gauges are available on request. Finishes are smooth or embossed, as desired.



SEIBERLING *Plastics Division* FACILITIES

assure top-quality rigid plastic sheets and prompt delivery

PRESS LAMINATED SHEETS

standard sheet size, 48" x 96"... high- and normal-impact P.V.C. for corrosion applications . . . decorative P.V.C. panels . . . heavy-gauge, formable, high-impact P.V.C.

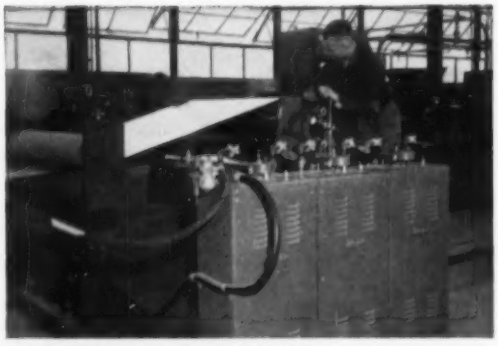
CALENDERED SHEETS

widths up to 51½". . . superior high-impact polystyrene . . . normal- and high-impact P.V.C. for corrosion resistance . . . and formable high-impact P.V.C. for vacuum forming.

EXTRUDED SHEETS

widths up to 48". . . high-impact polystyrene.

Delivery is prompt—can be made in 10 days to two weeks. Individual attention is given to every order for SEILON and production of rush orders is expedited. For further information, please write:



EXTRUDING produces SEILON in gauges from .010 to 1" with sheet widths up to 48".

Plastics Division **SEIBERLING RUBBER COMPANY**
NEWCOMERSTOWN, OHIO • PHONE 8-8304

More Machine for Your Money!

Machine for machine...in each class size...the Fellows line offers you greater opportunity for profits...whether you are mass producing consumer items...or molding extremely difficult industrial pieces.

In terms of SPEED...FULL AUTOMATIC OPERATION...TEMPERATURE CONTROL...INJECTION RATES...FAST SET UP...EXTRA SAFETY... and just plain ordinary DEPENDABILITY...Fellows injection molding machines offer you the ultimate in high level performance. For specific proof: ask any Fellows Plastics Specialist for a "tell-all", feature-by-feature comparison with any other machine on the market.

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injection molding equipment

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Whatever you make from glass fabrics—

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New! Epoxy, Phenolic, Silicone and D.A.P. preimpregnated materials now available in many standard fabrics. Write your nearest Trevarno sales office for complete specifications, price information.

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Trevarno

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Monsanto's versatile line of plasticizers meets every need from film . . . to floor tile

S-160 . . . Santicizer 160, the lowest-cost primary plasticizer, offers excellent heat and light stability, grease, oil, water and stain resistance. In addition, this product possesses excellent fusion characteristics and imparts good low-temperature flexibility to PVC compounds. Handles large quantities of fillers well. Widely used alone and in combination with other plasticizers such as DIDP.

DIDP . . . Compounds plasticized with diisodecyl phthalate possess excellent flexibility, retention of physical properties after severe heat aging, good plastisol viscosity stability and resistance to extraction by soapy water. In addition, they have lower pound-volume cost, volatility, and alkali extraction than DOP. Blends well with S-160.

S-606 and **S-613** (mixed phthalates) . . . Blends of S-160 and DIDP combining, at an attractive price, the best properties of each plasticizer. They also have better grease and stain resistance and faster processing than DOP with comparable volatility. Specially suited for vinyl floor tile.

S-141 . . . Santicizer 141 is an excellent *nontoxic* plasticizer offering superior flame retardance and the same low-temperature flex as DOP, *plus* improved light stability, stain and oil resistance and faster fusion and processing characteristics. Used in food wrapping, paper coating, film, sheeting. Pound-volume cost is less than the phosphate esters such as TCP. Made only by Monsanto!

Santicizer: Reg. U. S. Pat. Off.

FOR MORE FACTS on S-141, S-160, DIDP, S-606 and S-613, mail coupon below.

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- ☐ S-160
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little things count...
in making vinyl garden hose, too!
Small amounts of the *right* kind of stabilizers, carefully calculated to fit your production, can greatly improve the color, clarity and heat and light stability of vinyl garden hose . . . assuring longer service life and customer satisfaction. May we help you?
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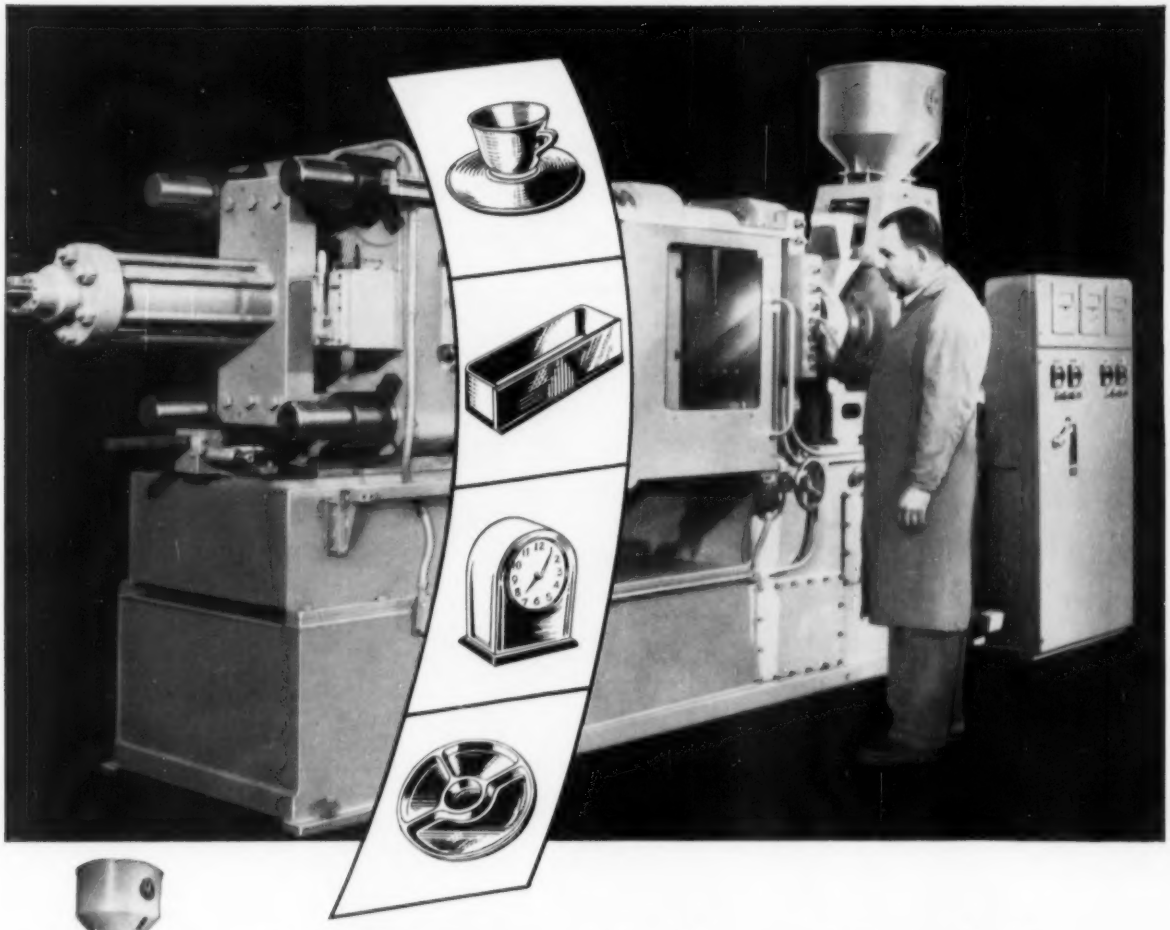
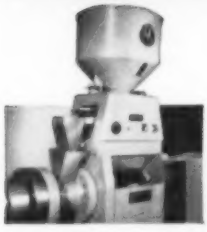
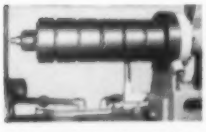
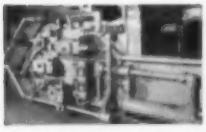




Powerful Injection Unit. 20,000 psi pushes plastic into all mold cavities.



Advanced Heating Cylinder design gives fast plasticizing.



Centralized Hydraulic Valve Panel. Single panel mounts every valve for easy inspection and minimum maintenance.

12 and 16 ounce Injection Molding Machines built for **TOMORROW'S** molding needs!

Lombard designers looked ahead . . . and built the increased speeds and capacities needed for future plastic molding into the Lombard machines of today!

Larger die platens, longer mold opening, faster speeds, and greater plasticizing capacities put these machines ahead of your present equipment . . . and open possibilities beyond normal limitations for improving methods, increasing production, and attaining higher quality of product.

The new production standards already achieved by these machines make them worthy of your investigation. Basic specifications and equipment are described in the Lombard Brochure, Form 5. Send for your copy today.

LOMBARD GOVERNOR CORP.

Injection Molding Division

ASHLAND, MASSACHUSETTS, U. S. A.

New York Area Sales Representative: The RAINVILLE Co., 647 Franklin St., Garden City, N. Y.

Kleestron at the ready

We make Kleestron

CRYSTAL 604 — dry colourant blend

CRYSTAL 467 — extruded pellets

DS — destaticised polystyrene

H — High Impact polystyrene

STANDARD COLOUR RANGE — samples on request

SPECIAL COLOUR MATCHINGS — 48-hour service

Kleestron polystyrene is packed with the convenience of the user in mind.

Fifty pound multi-wall paper sacks of minimum dimension simplify storage—save space—stack neatly. They are intended for modern handling techniques with fork trucks and pallet trucks.

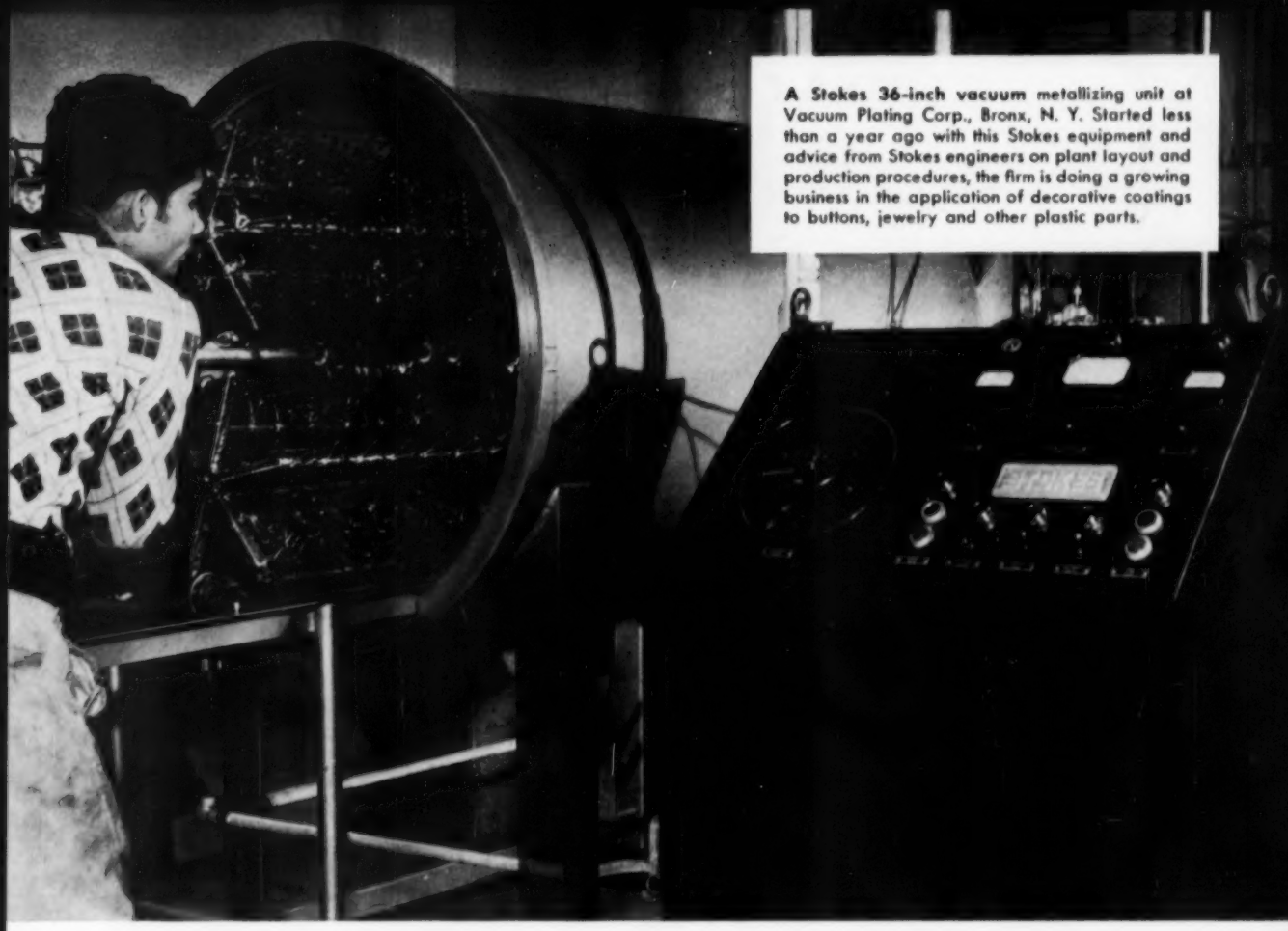
Each sack is marked with a label in the same colour as the material inside, helping selection from storage and preventing mistakes.

For export double sacks are used, for extra protection.

For D.S. material a polythene lining is used to keep out moisture.

Whatever type is inside—and wherever it goes—Kleestron polystyrene always arrives safe and sound, always at the ready.

KLEESTRON LIMITED • West Halkin House • West Halkin Street • London • SW1



A Stokes 36-inch vacuum metallizing unit at Vacuum Plating Corp., Bronx, N. Y. Started less than a year ago with this Stokes equipment and advice from Stokes engineers on plant layout and production procedures, the firm is doing a growing business in the application of decorative coatings to buttons, jewelry and other plastic parts.

The first high-production vacuum metallizer selling for less than $10,000

Brilliant, durable, metallized plastics are produced in quantity at Vacuum Plating Corp., Bronx, N. Y.

For firms just entering the vacuum metallizing business or for those expanding their operations in this growing finishing field, the Stokes 36-inch metallizing unit offers unusual advantages:

1) Low cost
2) Fast, 15-minute over-all cycle time
3) Simplified, push-button operation
4) High capacity . . . 200% greater than conventional 30-inch units
5) Interchangeability . . . the four part racks can be used in larger Stokes units, if operations demand more capacity.

Stokes builds vacuum metallizing equipment in 24, 48 and 72-inch sizes as well. Our vast experience in the application of this popular finishing method is at your service, to metallize your sample parts and advise on efficient plant layout. Send for an informative brochure on the Vacuum Metallizing Process, Catalog 780.

F. J. Stokes Machine Company, Philadelphia 20, Pa.

OFFICES IN PRINCIPAL CITIES, REPRESENTATIVES THROUGHOUT THE WORLD

STOKES

NEW, LOW-VISCOSITY CHLOROWAX®

speeds vinyl compounding

Now, DIAMOND's new, low-viscosity secondary plasticizer . . . CHLOROWAX LV . . . offers vinyl processors another way to reduce costs and improve quality. CHLOROWAX LV can give you all the advantages of Chlorowax 40, plus additional ease in handling and faster blending.

Viscosity of CHLOROWAX LV falls in the five poise range at 25° C.—a substantial drop from the 20- 40 poise range of normal 40% chlorinated paraffins. Viscosity of CHLOROWAX LV approaches that of commonly employed primary plasticizers. Plant handling is speeded because of greater flow rates.

Better fluidity tends to give flexible plastics better physical characteristics at low temperatures and is an added advantage in plastisol formulations requiring fluidity.

Greater stability of CHLOROWAX LV is important when processing heat is required and results in products with better stability and aging characteristics.

For information or technical co-operation in the use of CHLOROWAX LV or any other CHLOROWAX product (CHLOROWAX 40, 50, 70 and 70-S), write DIAMOND ALKALI COMPANY, Chlorinated Products Division, 300 Union Commerce Building, Cleveland 14, Ohio.

Notice how readily CHLOROWAX LV pours at room temperature. Can this speed handling and blending in your plant?

CHARACTERISTICS OF CHLOROWAX LV

Specific Gravity	1.13
Weight—Pounds Per Gallon	9.4
Viscosity—Poises 25°C.	5.1
Viscosity—S.U.S. 100°F.	902
Viscosity—S.U.S. 210°F.	70
Chlorine—Per cent	40
Solubility in Water	None
Toxicity	Non-Toxic
Odor	None
Flammability	Non-Flammable

DIAMOND CHEMICALS

Diamond Chemicals

DIAMOND CHEMICALS

SALES OFFICES: New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis, Houston.

DIAMOND DISTRIBUTORS: Dorsett & Jackson, Inc., Los Angeles; Carmona & Hawxhurst, Inc., San Francisco; Van Waters and Rogers, Inc., Seattle and Portland, U. S. A.; Harrisons & Crosfield (Canada) Ltd.

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Several years ago the Air Force asked us, "Can you build battery cases for jet planes? Can you make them tough . . . able to stand sub-zero cold and high engine heat? Can you make them lightweight, dimensionally stable and corrosion resistant? And can you produce them in large quantities?"

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Then, a company which manufactures replacement auto batteries told us, "We want everything the Air Force got and something more—a feature to make our cases sell faster." So, we went to work on this problem, and came up with color—molded-in color.

Today, bright, colored plastic battery cases are a major factor in the replacement battery business—bringing new sales to manufacturers and dealers and new value to their customers.

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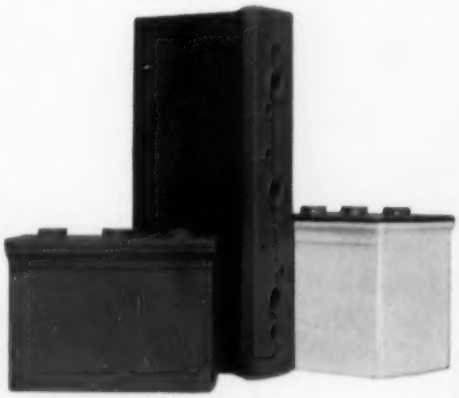

Plastic battery cases molded by the Plastics Division of General American Transportation Corporation.

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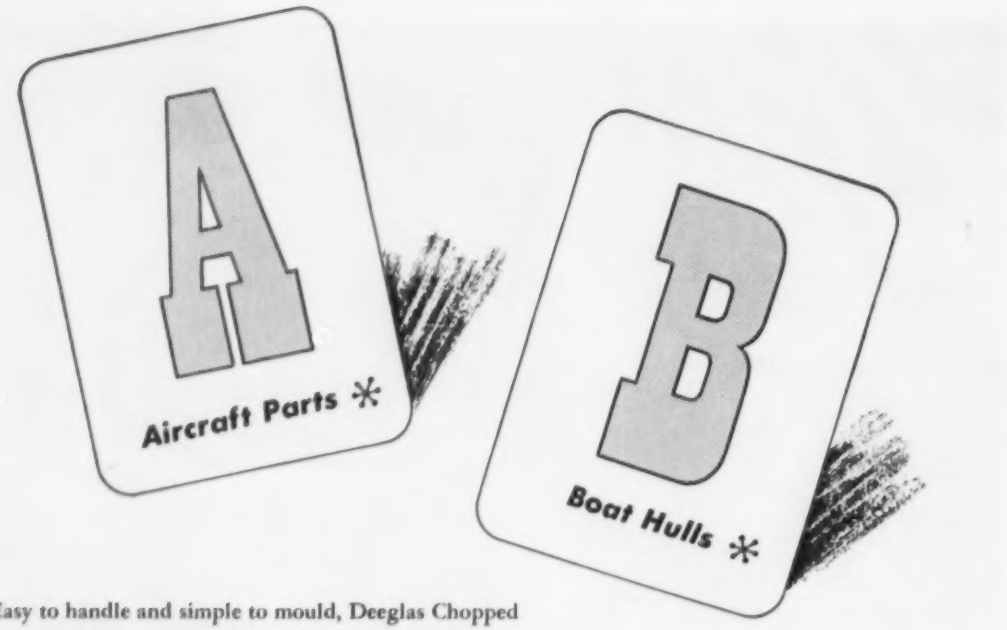

Easy to handle and simple to mould, Deeglas Chopped Glass Fibre Mat provides the *extra* strength needed to make plastic mouldings stronger and lighter. Its wide use in the aircraft, boat building and automobile industries is evidence of its outstanding advantages — even distribution of fibre, constant density and high tensile strength in all directions.

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Spencer Poly-Eth
Sales Representative

The Old Oaken Bucket now is made of polyethylene...It's a 12-qt. general purpose pail made by a Wisconsin molder... Same molder makes an ice cube tray that forms ice cubes in the shape of playing card suits...An Illinois molder makes an intravenous feeding valve from polyethylene...A nylon screw permits accurate metering of solutions.

In Chicago one of the country's largest housewares molders is turning out a 32-qt. pail weighing 2½-lbs... Same molder makes a sink drainboard that's said to have these advantages over rubber: lower cost, lighter weight, wider range of colors, greater resistance to cracking... A Chicago film extruder is producing polyethylene film with the ability to shrink tightly around poultry when exposed to temperatures slightly below boiling point of water.

Dripless paint cans are made possible by a polyethylene top made by a Minneapolis molder...Top is inserted after regular lid is removed.

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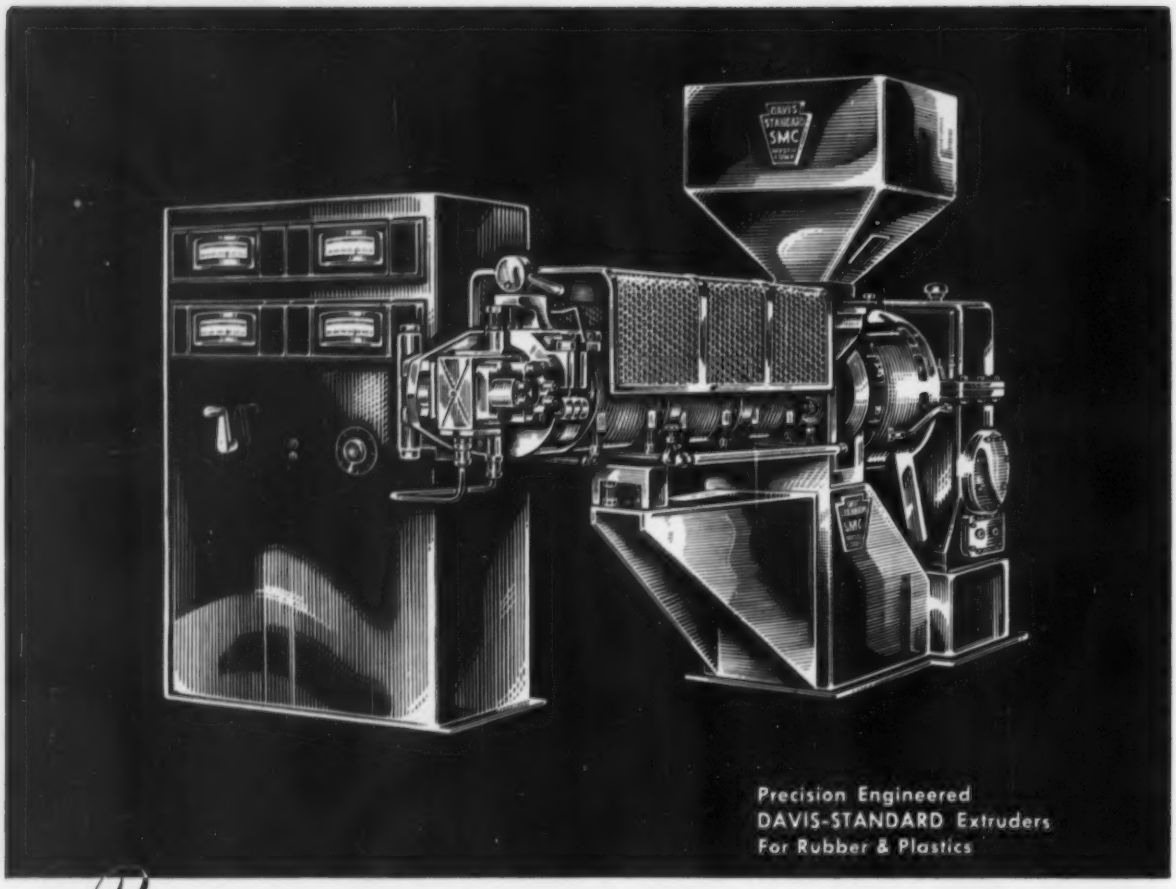

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IN every field of endeavor, there invariably emerges a champion, an elite, to serve as a standard by which the efforts of the rest may be judged. Whether in a man or a machine, the aura of quality, mark of the aristocrat, is unmistakable.

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Fire-resistant HETRON® Resins

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Now you can take advantage of the *inherent fire resistance* of HETRON® polyester resins in aircraft design and other military applications.

Three HETRON polyester resins are manufactured to meet the requirements of Specification MIL-R-7575A:

HETRON 92 ..... for Types I, II, III
with up to 10% added styrene

HETRON 32A ..... for Types I, II

HETRON 23 ..... for Types I, II

What this means: HETRON polyester resins greatly extend your range as a designer, specifier, or fabricator.

HETRON panels burn as long as a hot flame is applied, but "snuff out" as soon as the flame source is removed. HETRON *does not support combustion.*

Flame resistance is chemically locked into these resins. The result is unique stability. There is *no loss* of mechanical properties, as may occur when flame resistance is obtained by means of additives alone.

For complete information on HETRON resins, send today for technical data sheets listing properties of the liquid resins, cured unfilled resins, and glass cloth laminates, including detailed flame test data.

SEMI-RIGID RESIN: Here is a polyester with the strength of a rigid resin and the resiliency of a semi-rigid resin. **HETRON 32A** is a medium-viscosity, semi-rigid resin combining excellent impact strength with resistance to crazing. This versatile resin is being used in large quantities for its physical properties and resistance to heat degradation, with fire resistance as an added bonus.

HETRON 92 is a medium-viscosity rigid resin (15 poises). It has the highest degree of fire resistance of the three resins listed here.

HETRON 23 is a medium-viscosity rigid resin with good color clarity, low shrinkage and fast cure. It is both fire resistant and heat resistant.

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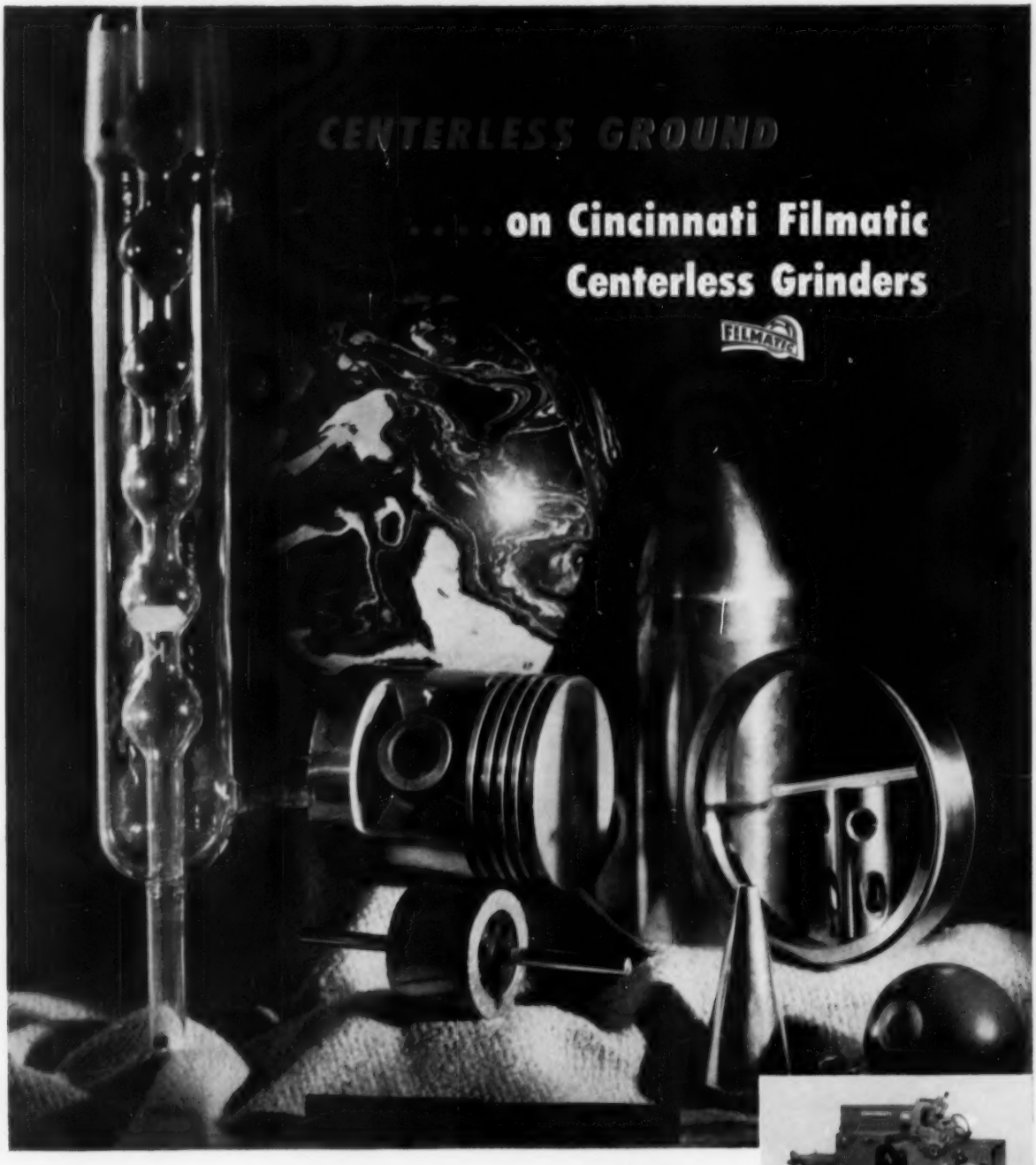

Plastics are prominent in this illustration. These parts were Cincinnati centerless ground to extra high-quality finish and accuracy at negligible unit cost. Our engineers are experienced in tooling up CINCINNATI FILMATIC Centerless Grinders for work of this type. And it may pay you to talk to them about your parts or products made of plastics. Give us a call for a methods conference at your convenience. Meanwhile, write for literature.

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New CINCINNATI FILMATIC No. 2 Centerless Grinder, Catalog No. G-644. Other CINCINNATI FILMATIC Centerless Grinders suitable for plastics work: No. 0, No. 3, No. 4.

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CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
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Cold flow resistance of TEFLON* and reinforced TEFLON (DUROID 5600) was tested at 700° F., under a torque of 35 pounds and a flange pressure of 1,000 p.s.i. After 2 hours the flanges were cooled and the bolts retightened. The flanges were then exposed to the heat for another 2 hours. Results are as pictured. The gasket of TEFLON (left) extruded extensively on all edges and lost all bolt torque. DUROID 5600 did not extrude and retained 15 pounds bolt torque, demonstrating significantly improved resistance to cold flow.

Greater Resistance to Heat Distortion

TEFLON (left) distorted badly when subjected to 720° F. and then cooled. Reinforced TEFLON (DUROID 5600) exposed simultaneously to the same temperature retained flatness, demonstrating greater dimensional stability at high temperatures.

SOME IMPORTANT TEST VALUES

Tensile Strength, MD, psi	2500
Tensile Strength, CMD, psi	1500
Compressibility, 5000 psi, %	8
Thermal Expansion Coefficient per °F., 73-140°F.	2.7×10^{-5}
Heat Distortion Temperature, °F.	
66 psi	500+
264 psi	500+
Deformation under Load, %	
1200 psi	2*
2000 psi	3*
Coefficient of friction against polished steel,	
static	.21
kinetic	.14
Specific Gravity	1.90

*Made up of actual flow and also of compression under load. Data to indicate breakdown between these two portions is being obtained.

ROGERS REINFORCES "TEFLON" TO REDUCE ITS COLD FLOW

Rogers DUROID 5600 is a combination of TEFLON and inert fibers, blended into an homogeneous sheet material. This new material is not a replacement or a substitute for TEFLON, but rather an extension of it. TEFLON has better electrical characteristics and dry lubricating qualities. DUROID 5600, however, has much of TEFLON'S resistance to chemicals, and is greatly superior to TEFLON in resistance to cold flow and heat distortion.

*Registered trademark of DuPont Company for its tetrafluoroethylene resin.

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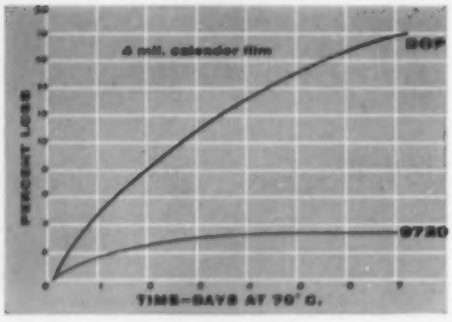
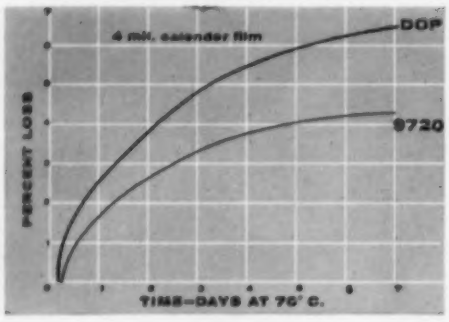
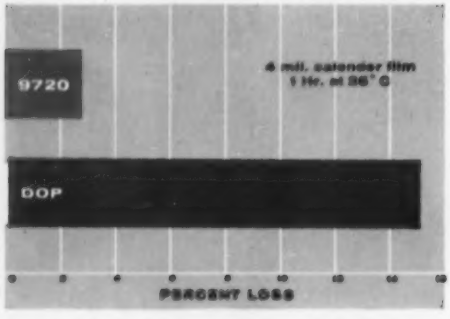


MINERAL OIL EXTRACTION

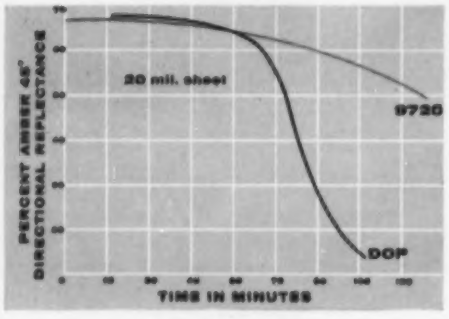


PERMANENCE

GASOLINE EXTRACTION



HEAT STABILITY



...from PLASTOLEIN® 9720, the lowest-cost polymeric plasticizer available

In giving unusual permanence to plastics, you will find that Emery Plastolein 9720 will help make a name for your sheeting and coated fabrics. It has proven its superiority by imparting the kind of outstanding durability and weatherability demanded by fabricators of finished plastic products.

Glance at the illustrated charts, and note its extremely low volatility, excellent resistance to mineral oil and gasoline extraction, superior heat stability. Equally important, Plastolein 9720 is the lowest cost polymeric type plasticizer available.

Furthermore, its lower-than-usual viscosity facilitates handling and permits bulk handling of tank car quantities.

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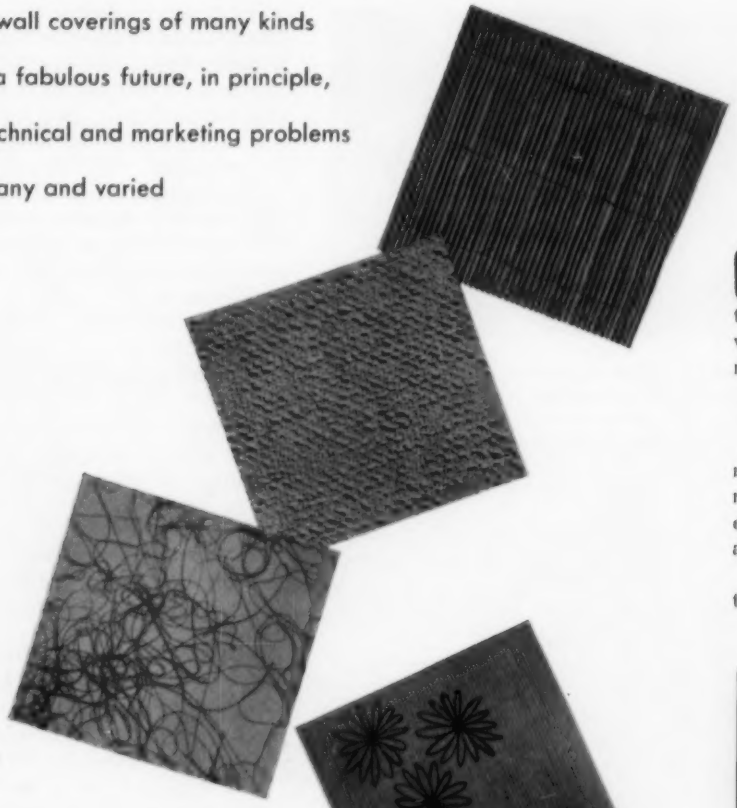
MODERN PLASTICS

Big Market–Big Challenge

Vinyl wall coverings of many kinds have a fabulous future, in principle, but technical and marketing problems are many and varied



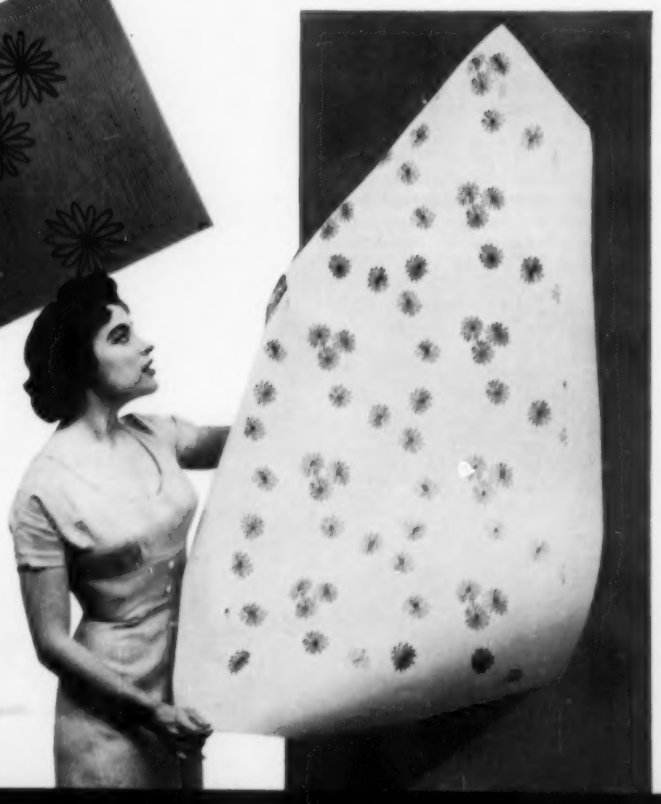
ONE of the most thought-provoking and controversial propositions to be advanced to the seers of the vinyl industry in a good many years might be stated as follows:

Given: A bare wall.

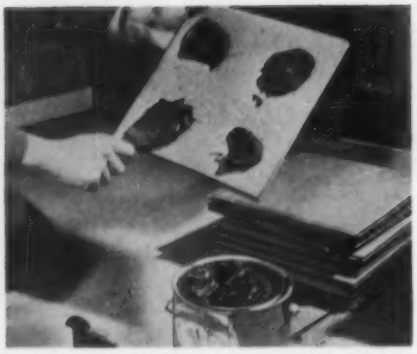
Given: A vinyl resin.

The problem: How to use the vinyl most economically and efficiently to manufacture an attractive wall covering that will be practical from an application standpoint.

The answer? Nearly everyone in the vinyl industry claims to have



Wall coverings based on vinyl resins are distinguished by deeply textured surface finishes or unusual design effects. The typical finishes illustrated above include (from top to bottom): a fabric-backed covering with a three-dimensional vinyl surface molded to simulate bamboo (L. E. Carpenter & Co., Inc.); another fabric-backed covering with a raised textured vinyl surface simulating woven cloth (L. E. Carpenter & Co., Inc.); an ultra-modern pattern consisting of free-falling yarns laminated between two sheets of vinyl (Laminated Plas-Tex Corp.); and a vinyl-fibrous glass laminate in a striated effect with a dandelion print (Hess, Goldsmith & Co.) for use as a decorative wallpaper-type covering (right)



Courtesy Bakelite Co.

Fibreboard panels with covers of tough vinyl sheeting designed to give long service without constant care can easily be installed on most wall surfaces (left) using only four dabs of acoustical tile cement (top, right) on the back. Where necessary, panels can be cut and the vinyl sheet pulled over the cut edge and stapled in place (bottom, right)

found a solution and more solutions are on the way; exactly which is going to capture what part of the market is still a subject for hot debate.

Favorable Factors

The present and potential market for this application is estimated by a leading manufacturer as follows: "1954's over-all plastic wall covering market at consumer level reached the $10 million mark; 1960 should see a $50 million market in the plastic wall covering field."

Most other manufacturers agree with this estimate. If anything, they feel it is an understatement.

In short, the market is fabulous; but—and it's a big BUT—the technical, merchandising, and distribution problems involved are in proportion. In recent months, numerous companies have entered the field. Some of them are operating successfully; others have already found themselves in trouble simply because of inadequate preparations.

The pioneers in the field have already testified to the tune of hundreds of thousands of dollars, spent over the years on research, on setting up a distribution system, and on replacing defective installations, that the wall covering market is not as simple to crack as it first appears. A potential producer must be willing to expend large quantities of both time and money . . . but the pot of gold at the end of the rainbow can be a big one.

One favorable aspect of the situation is that manufacturers of conventional wall coverings have become aware that vinyl is not a competitive material but offers a desirable means of complementing their present lines.

Secondly, many of the raw material suppliers have begun to realize the extent to which the market has grown and stand ready to spend money on consumer and dealer promotion. Similarly, many of the pioneers in the field (five years or over) feel that their major technical problems have been licked and are beginning to swing funds over from research to merchandising.

Thirdly, the United States is currently in the midst of a building boom that is going to mean an expanding market for plastics building and decorator materials of all types.

And finally, there is a definite styling trend today toward the use of textured wall surfaces (such as are possible with vinyl) to replace flat painted areas.

All of these factors are certainly attractive inducements to prospective producers, but the vinyl wall covering market is going to reach its predicted potential only if it is built on quality production and solid merchandising practices. Anything else will harm the vinyl industry.

Commercial installations in hospitals—where toughness and ease of maintenance are essential requirements—are a growing market for wall coverings based on vinyl materials

Courtesy Bolta Products, Inc., Div. General Tire and Rubber Co.

Types of Coverings

On the market today are wall coverings that fall into the following categories:

1) vinyl-coated papers

2) vinyl-coated fabrics (including fibrous glass cloth)

3) vinyl film or sheeting laminated to fabric, metal, etc.

4) unsupported vinyl film

5) unsupported vinyl sheeting (including wall coverings vacuum formed from rigid vinyl sheeting and wall coverings consisting of vinyl laminates).

Within each category, there is again considerable differentiation based on variations in material thickness, adhesives, formulations, backing materials, and methods of embossing, printing, and decoration. As a result, the descriptive term "vinyl wall coverings" has proved a source of confusion to architects, decorators, and consumers.

Public or Residential

As the industry is set up at present, the major differentiation between various types of coverings is the thickness of the vinyl surface and the type of backing.

In a paper presented by A. G. Whyte, U. S. Plywood Corp., before the Fifth Plastics Film, Sheeting, and Coated Fabrics Div. Conference, one line of demarcation was set up as follows: "The coated papers and some cloths, generally speaking, fall into the wallpaper groups, both price-wise and utility-wise, although each represents heavy-duty, beauty, and service, when related to conventional wallpapers.

"The heavier-gage vinyl-coated fabrics as well as the top-printed and pigmented sheets fall into a group of heavy-duty commercial and industrial type wall coverings of which are required beauty, durability, cleanability, and resistance to the wear and tear of hospital, restaurants, and office building service."

Because of the pricing situation and the fact that most of the heavy-gage materials require professional installation, the manufacturers of these types do not anticipate ever going after the home market to any great extent. But for the manufacturers of lighter-gage sheets and coated fabrics, the domestic and semi-commercial fields appear to be lucrative and promising outlets.

To get at this latter market, the vinyl wall covering industry has already started to design and introduce a number of products intended specifically for self-application by the "do-it-yourselfer." Most of these are in the category of prepasted or pressure-sensitive adhesive-backed materials—and more are on the way.

Durability and toughness are, of course, prominent features of vinyl wall coverings. The heavier the gage, the higher the degree of abrasion resistance. Such top-quality products as Bolta-Wall (Bolta Products, Inc., Div. General Tire and Rubber Co., Lawrence, Mass.), Victex (L. E. Carpenter & Co., Inc., New York, N. Y.), and Kalistron (U. S. Plywood Corp., New York, N. Y.), have been in service now in some commercial installations (such as hospitals, cafeterias, office corridors, etc.) for over five years—with no reported failures.

One typical abrasion test run on

Courtesy Bolta Products, Inc., Div. General Tire and Rubber Co.

"Do-it-yourself" vinyl coverings include prepasted tile that is simply wet on the back and applied to the wall . . .

Courtesy Cohn-Hall-Marx Co.

. . . unsupported vinyl film backed with a pressure-sensitive adhesive enabling it to be easily pressed into place . . .

. . . and a self-adhesive quilted material (two sheets of vinyl and a fabric filler electronically sealed together)

Courtesy Harte & Co., Inc.

a vinyl wall covering (in this case, Kalistron) showed that the vinyl product had from 10 to 17 times the resistance to wear and abrasion of battleship linoleum. The same abrasion resistance, although naturally in a lesser degree, is exhibited in the lighter-gage materials. United Wallpaper, Inc., Chicago, Ill., for example, reports that their Varlar vinyl-coated paper when wet with a ⅛ of 1% solution soap and subjected to 25 revolutions of No. 600A sandpaper showed no visible signs of wear, except a slight development of gloss.

Another important feature of vinyl wall coverings is the fact that they can be cleaned in less than half the time necessary for conventional wall surfaces and without the use of strong detergents or hard scrubbing. Ink stains, pencil and crayon marks, grease and oil spots, and other common stains may be removed easily without damage to the wall covering.

Variations in color and texture are also a large part of the vinyl wall covering picture. The availability of

Photos courtesy National Vacuum Molding Corp.

Simulated brick texture wall coverings, vacuum formed from sheets of rigid vinyl, lend decorative touch to kitchen . . .

. . . and living room. To install the tough, easy-to-clean covering, adhesive is first applied to the wall area . . .

. . . and the covering is pressed into place. Adjoining sheets are designed to interlock for better alignment

embossed or decorated materials in textured patterns (e.g. grass cloth, bamboo, rattan, etc.) fills an important gap between the simulated materials (which are expensive, fragile, and difficult and costly to install) and flat painted surfaces.

Price Factor

Once each manufacturer has solved his own technical problems, the price situation still must be faced. One of the most inexpensive vinyl wall coverings on the market, vinyl-coated wallpaper, sells for about $1.50 to $1.60 a roll (36 sq. ft.), in contrast to the most inexpensive wallpaper on the market at 50¢ to $1.10 a roll. Others in the heavy-duty category run up to 50¢ and higher a sq. foot.

In commercial applications, this price differential is proving to be less of a factor every day. The ever-growing list of buildings that have switched over to vinyl wall coverings already includes such high-caliber names as Hotel Roosevelt, New York (Vicrtex); Waldorf Cafeteria, Cambridge, Mass. (Bolta-Wall); and St. Vincent's Hospital, Bridgeport, Conn. (Kalistron).

In residential applications, price has been more of a deterrent. But the economy and ease of installation of the "do-it-yourself" applications have already made the consumer more aware of the advantages of vinyl wall coverings. And, as one architect put it, "even if the vinyl wall covering industry maintains its present price level, it seems logical to me that the home owner is going to raise his standards to meet the price. The vinyls are just too good a material to miss. Where irreparable damage will be done, however, is where the manufacturers foolishly endeavor to make their product price competitive by cutting down on quality."

Heavy-Gage Materials

Among the heavier-gage materials, major outlets, thus far, have been to that area where professional installation is a requirement (al-

though Bolta does make available a prepasted tile that can be applied by do-it-yourselfers simply by wetting the back with water). With the exception of this Bolta prepaste tile, heavy-gage materials require that an adhesive, usually in paste form, be applied to the wall area on which the covering is to be installed.

Bolta's product (Bolta-Wall) is made up of a tough, outer layer of vinyl, pressure-laminated to a rubber-saturated paper backing. The outer layer is 0.011 to 0.013 in. thick and the backing is 0.025 to 0.030 in. thick. The product is available in mahogany, bamboo, or leathergrain textures in roll form (for professional installation) or in 8-in. sq. tiles (for do-it-yourselfers).

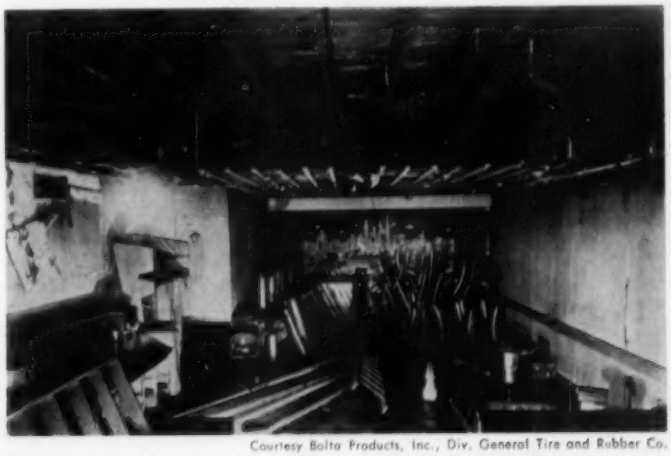
Carpenter's material (Vicrtex) consists of a layer of vinyl (using resins supplied by B. F. Goodrich Chemical Co.) applied to a firm cotton backing. During production, the vinyl resin and the fabric backing are fed through a set of rolls, one of which has been engraved with a depressed pattern. On contact with this heated pattern roll, the vinyl melts and flows into its indentations. When the pattern roll is pressed against the fabric, the vinyl layer is transferred to the fabric as a raised pattern. Vicrtex is available in 20 different textures (from bouclé to palmetto) and in 36 standard decorator colors.

U. S. Plywood's wall covering (Kalistron) is made by fusing a colored lacquer to the underside of a 22-mil clear sheet of calendered vinyl (supplied by Bakelite Co.) and then applying a cellulose-type flock

(*To page* 216)

Courtesy B. F. Goodrich Chemical Co.

Smooth vinyl coating adds all the desirable qualities of washability, resistance to stain, and a high degree of abrasion resistance to conventional wallpapers

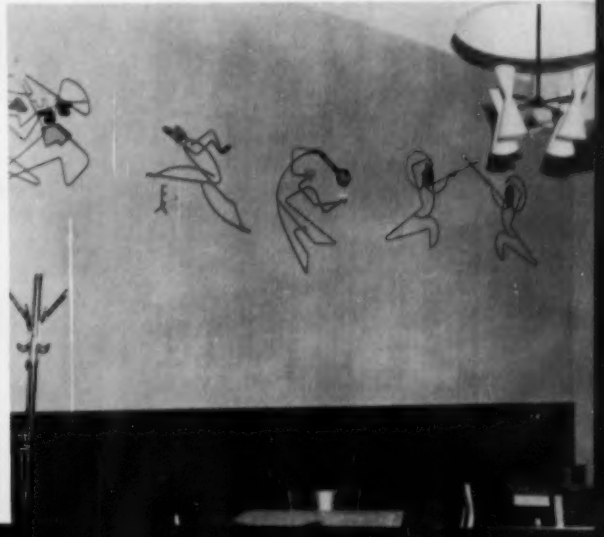


Courtesy Bolta Products, Inc., Div. General Tire and Rubber Co.

Dramatic proof of fire resistance of vinyl wall covering: while ceiling and fixtures were devasted by fire that gutted restaurant, coverings remained virtually intact

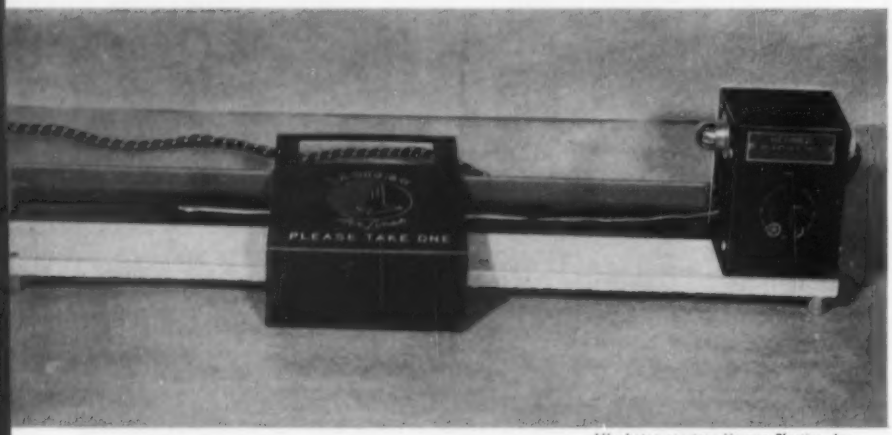
Installation of vinyl wall covering in cafeteria (right) is a relatively easy job, requiring only two men (left)—one to cut the material, while the other, on a small portable staging, first applies the adhesive and then assists in fitting the covering into place

Courtesy Bolta Products, Inc., Div. General Tire and Rubber Co.



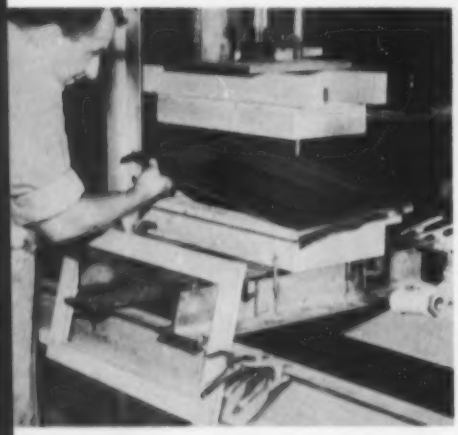
Nameplates, tags, markers, and instrument panels, for years made of rigid laminates, now take on added market possibilities with the development of thermoplastic

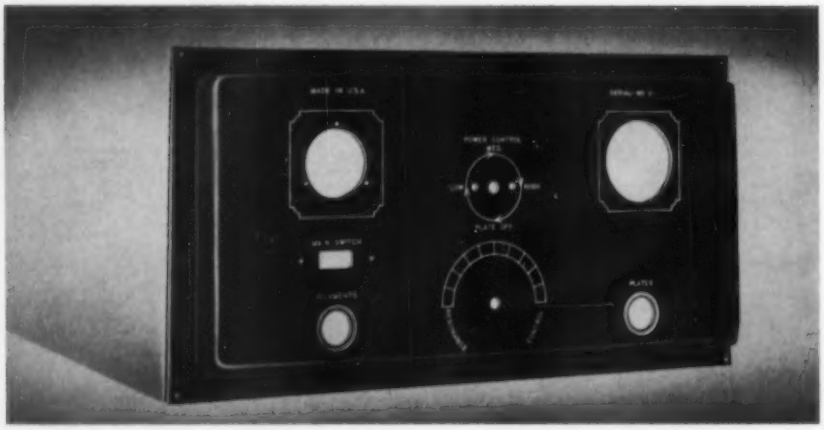
Flexible Engraving Stock



All photos courtesy Hermes Plastics, Inc.

Attractive literature holder for counter top display use (right) is made by heating flexible engraving stock and bending it to shape (left). Stock, which consists of three layers of styrene copolymer sheet, is cut to size and engraved before being bent





Engraved flexible laminated stock can be handled like ordinary thermoplastics sheet and vacuum formed (left) into easy-to-read, durable instrument panels (right). The forming operation eliminates need for many previously required assembly and mounting steps

Flexible styrene copolymer engraving stock can be readily cut to any shape desired, using nothing but scissors or other paper-cutting tools

By bending stock back to form integral easel, nameplates that stand on desks without toppling can be produced

FOR neat and permanent identification, manufacturers have found few materials to be the equal of plastics engraving stock in the fabrication of nameplates, directional signs, tags, and markers of many kinds. Over the years, rigid engraving stock (usually in the form of a phenolic laminate) has managed to build up a sizable business—and a solid reputation—for itself in applications of this type.

As suitable as the phenolic laminates have proved to be, however, the fact that they are rigid has, of necessity, limited their use to flat surface applications. Now, with the introduction of the first flexible, formable engraving stock to be marketed, a whole new raft of possibilities—including the fabrication of business machine housings and instrument panels—has been opened up in those areas where requirements call for a material that can be bent or formed to the contour of the object to which it will be attached.

Two companies currently supplying flexible engraving stock of this type are Hermes Plastics, Inc., New York, N. Y. (Gravoflex) and Bolta Products, Div. of The General Tire & Rubber Co., Lawrence, Mass. (Bolta-Grav).

Essentially, plastic engraving stock is a laminate consisting of two or more layers of sheet plastic or plastic-impregnated materials in contrasting colors (a typical "sandwich" of this type is made up of three layers—the two faces in one color and the core in a sharply contrasting color). Thus, when the face material is engraved down to the core, lettering and marking will stand out in the color of the core material on a field the color of the face material.

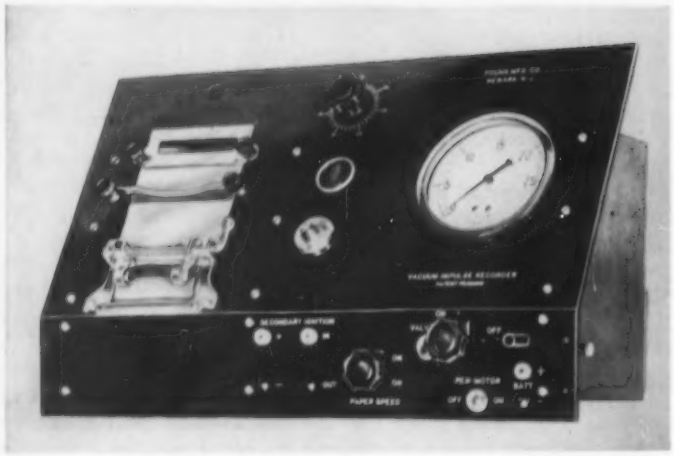
Prior to the introduction of plastic engraving stock, most nameplates, identification markers, etc., were engraved on sheet metal—brass, steel, or aluminum. The use of metal, however, posed several basic disadvantages: 1) sheet metal is difficult to engrave; 2) after engraving, the grooves had to be filled with paint to provide contrasting color (and, within a short time, the paint would dry up and flake off, making it difficult to distinguish the lettering and markings); and 3) sheet metal is subject to rust or tarnish and does not clean easily.

Among the first materials to offer a means of overcoming these disadvantages were the rigid phenolic laminates. The surface sheet of the laminate is phenolic-impregnated paper in one color and the core is urea- or melamine-impregnated paper in contrasting color. According to Hermes Plastics (still a volume supplier of laminated phenolic nameplates, disks, strips, and sheets), the two-color laminate, by eliminating the paint fill-in operation, represented important production economies and meant better visibility and more permanent markings.

A top sheet of specially treated paper printed in colorful patterns made the laminate considerably more attractive than sheet metal. The plastic material was also easy

Unlike rigid stock which is brittle and has a tendency to crack, the flexible material can be drilled, riveted, or nailed directly onto a wall or post

For attachment to surfaces that are not flat, engraved laminate is simply bent to shape and fastened in place



Among typical applications for laminated engraving stock is its use in the production of instrument panels. Top photo shows panel made in one piece of flexible laminate, bottom photo depicts panel fabricated of rigid stock. Advantages of using flexible material in making such instrument panels are that 1) appearance is improved, 2) fewer mounting holes are required, and 3) fabricating time is reduced

Nameplates are easily engraved on flexible stock with portable pantograph machine. Because center layer of laminate is in contrasting color, markings show up clearly

to wipe clean, would not rust or tarnish, was weather-resistant, would not corrode, and was easier to engrave than metal.

Flexible Laminate

Now, with the introduction this year of the flexible laminates, the sphere of activities for plastics engraving stock has been rounded out to take in many new applications heretofore believed impossible or too costly to produce.

As supplied both by Hermes and Bolta, the flexible laminates are made up of three layers of styrene copolymer sheet. The Hermes material is based on Royalite sheet supplied by U. S. Rubber Co.; Bolta's product is based on its own Boltaron sheet.

Unlike the rigid laminated phenolic stock, which requires use of expensive carbide-tipped engraving tools, the flexible material can be engraved simply with high-speed steel cutters. And when a section is to be cut from a sheet of the flexible laminate, the job can be done with scissors or a paper cutter.

The tough styrene stock will not chip, break, or shatter during machining, when being nailed directly to a wall or post, or even in rough service. This fits it for a number of applications where extraordinary abuse might be expected including grave markers, signs in parks, schools, or hospitals, automobile identification tags, and markers on ships or in factories where vibration of the equipment might shake the paint loose from metal plates.

Other advantages of the flexible laminate engraving stock: it is supplied in a handsome leather-grain finish that not only is attractive, but will not scratch or scar and is nonglaring; it weighs much less than the phenolic laminate (up to ¼ less) or sheet aluminum (from ⅛ to ⅔ less); it does not conduct electricity, is flame resistant, and is unaffected by glycerine, oils, solvents, naphtha, alcohol, and many other materials; and, because it is so tough, manufacturers can now use 1/16-in. stock where up to now ⅛-in. rigid phenolic has been required for many applications.

Formability

Perhaps the major advantage of the flexible material, however, according to Hermes Plastics, is that

it can be bent and, when heated to 280° F., can be formed into intricate shapes with relatively light and inexpensive equipment. Although the flexible material has only been on the market for a few months, a number of potential large-volume formed applications have already sprung up. Hermes lists the following as most promising:

1) Instrument or control panels that have to be bent or curved to conform to the shape of the chassis to which they are to be attached. (Previously, two or more separate sheets of rigid laminates had to be joined together to provide a panel for any area that was not flat. This meant not only added labor costs for assembly but, in many instances, the rigid sheet material was weakened at the mounting holes and would shatter or crack. Now, using the flexible material, the plastic laminate can be engraved and then formed in one piece to the desired shape. Forming does not distort the engraved lettering or markings. In another variation, the flexible plastic engraving stock can be laminated to sheet metal using a special adhesive and then formed to shape. Thus, using the flexible stock as covering material, the finishing and anodizing operations which would be required for the conventional metal instrument or control panel are eliminated, lettering and markings are clearer and will last longer, and the appearance of the housing to which the panel is attached is greatly enhanced.)

2) Nameplates, signs, or counter displays that can be bent lengthwise across the bottom to eliminate the need for an easel or bent crosswise at the sides so that they can be mounted directly on a wall or post without requiring metal brackets.

3) Markers, signs, tags, etc., that can be bent around pipes, trees, or other tubular or irregular shaped objects and attached by nailing, riveting, stapling, cementing, sewing, or other means.

Translucent Stock

Related to the opaque plastics engraving stocks are translucent materials that can be backlighted to highlight the lettering and markings for better visibility at night.

In most cases, backlighted nameplates, markers, panels, etc., are engraved from blocks of acrylic and, since they do not involve a laminate of plastics materials in contrasting colors, cannot be considered in the realm of engraving stock. One company, however, Universal Aviation Equipment, Inc., New York, N. Y., is currently marketing a product that lies in the area between the translucent material and true engraving stock.

The material supplied by Universal is an engraving stock only in the sense that it is a laminate of plastics sheet in contrasting colors. In manufacture, a thin layer (0.008 in. thick) of white translucent vinyl film is bonded under heat and pressure to a block of clear transparent acrylic, approximately 0.187 in. thick. A black vinyl film (0.004 in. thick) is then bonded to the face of the white film. The acrylic is supplied by Rohm and Haas Co.; the vinyl film by Bakelite Co. and Monsanto Chemical Co.

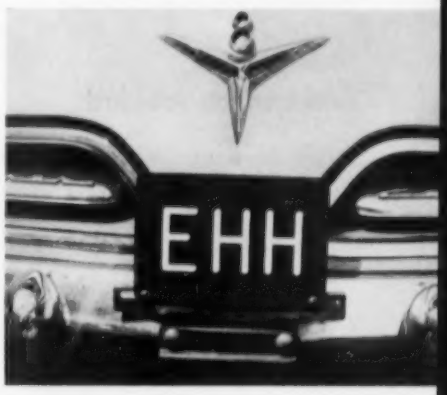
An intaglio steel die is applied to the black vinyl face of the laminate to produce the desired lettering and markings. Under heat, the vinyl flows into the recesses of the die; when the laminate has cooled, the various markings appear as raised areas on the black surface. The raised black areas are then shaved away so that the white shows through.

Because the white markings are thus flush with the black background, panels and dials made from the material can be read at the widest possible angle. For clear, easy-on-the-eyes night reading, light is "piped" through the acrylic from small, red-filtered lamps. The light shows through the panel wherever the white translucent vinyl film is exposed.

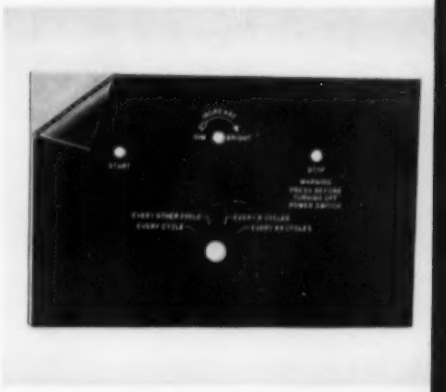
Military Applications

At the present time, major outlet for the acrylic-vinyl stock is in control and instrument panels of aircraft. In addition to the excellent visibility it affords, the material is ideally suited for such use because of its resistance to humidity and salt spray, its resistance to extremes of temperature (from —65 to 85° C.), its resistance to abrasion and shattering, and the fact that it is self-extinguishing.

At the present, pricing and production problems have restricted the material to military applications. However, the producer is confident that there is a potential large-volume market for its product, once mass-production economies can be effected, in the fabrication of dials, knobs, panels, etc., for radio and television sets, telephones, automotive instruments, etc.



Personalized "license" plate made of engraving stock can take much abuse



Metal covered with engraving stock needs no anodizing or other finishing

Identification of round objects is easily accomplished with flexible laminate

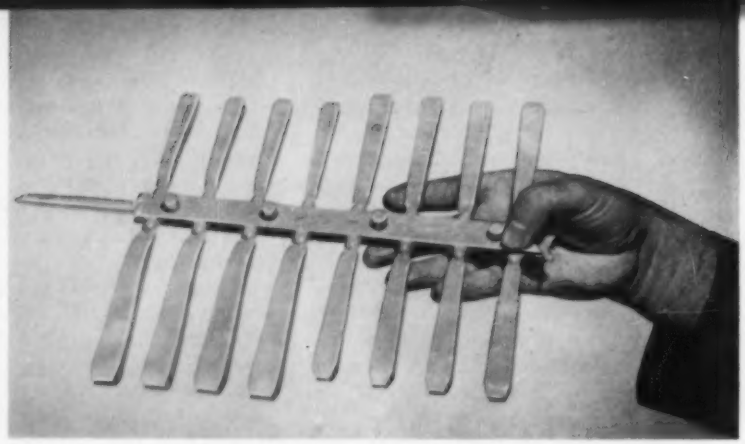
Tougher cellulosic material

is heat resistant,

dimensionably stable,

and can be molded

with a hard, lustrous surface



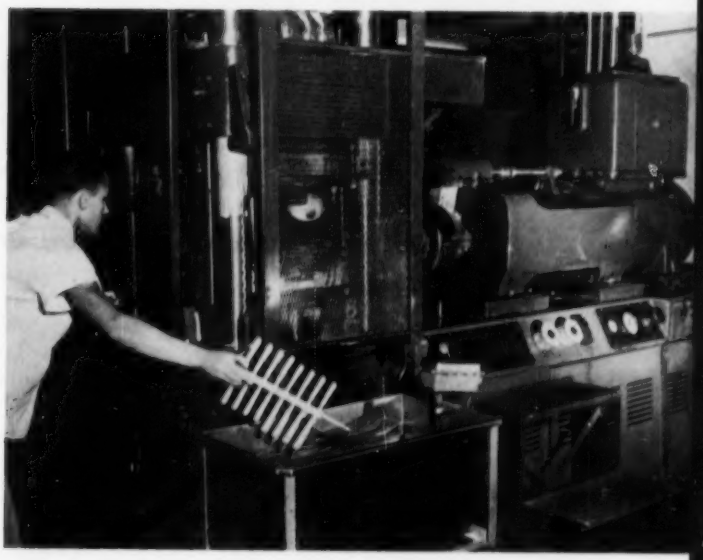
Sixteen acetate cutlery handles in three different sizes are produced in each shot (approximate weight of shot is 16 ounces)

Improved Acetate for Broader

Heat-resistant handles molded of improved acetate can be safely cleaned in automatic dishwashers

End openings in the handles, used for assembly purposes, are formed by side draw core pins in the mold, which retract as the mold opens to permit removal of the complete shot

Before sprues and runners are clipped off, shot is placed in a 140° F. quench bath for 4 minutes



Usage

INTEREST in cutlery handles as a market for cellulosics has been accelerated by the successful introduction of the first molded "dishwasher proof" handles to be commercially produced using a new type of tough acetate.

As described by Hercules Powder Co., suppliers of Hercocel W, the material, by virtue of its toughness, high heat resistance, and lustrous finish, is claimed to be ideally suited for cutlery handles—but up until a few months ago, only a handful of experimental handles had been run off for test purposes. Now, Royal Brand Cutlery Co., Div. of National Silver Co., Brooklyn, N. Y., has jumped into the field with a complete line of tableware and kitchen utensils handsomely handled with Hercocel W. And judging by early reports of consumer and retailer response, National Silver feels that the availability of the new material will do much to brighten the thermoplastic handle sales picture.

High Heat Resistance

Although basically a cellulose acetate, Hercocel W is stated to offer improvements in properties and performance over the conventional product. From the standpoint of the specialized requirements for cutlery handles, the most important of these improvements are high heat resistance (heat distortion temperature is 225° F.) and low moisture sensitivity . . . adding up to good dimensional stability even under load in hot, humid atmospheres. The new handles can thus be cleaned in automatic dishwashing machines (in some cases involving water spray temperatures as high as 190° F.) without distorting or warping and without pulling away from the metal tangs to which they are attached.

The handles also combine exceptional toughness with high surface hardness for long-wearing qualities. Because the material is resistant to attack by grease, oils, and perspiration, cutlery handles made of it will retain their lustrous finish even with frequent handling.

And because Hercocel W is a thermoplastic, National Silver can still use its electronic induction assembly method to form a strong, long-lasting bond between the plastic handle and the steel tang. In this

Molded-in openings in handle tops are then checked on a "go no-go" gage

assembly process, the end of the metal tang is slipped into an opening molded into the handle. High-frequency induction heating is then used to heat the tang so that the adjacent acetate material melts and flows around it. Thus, when the assembly cools, the acetate hardens around the tang, locking it permanently in place.

Molding Procedure

The handles are molded for National Silver by St. Clair Plastics, Inc., Watervliet, N. Y., in a 16-cavity mold set up in a 22-oz. Impco injection molding machine. Three different size handles (eight of one size, four each of two other sizes) are produced in each shot (approximate weight of shot is 16 ounces). And since the handles are designed to be used for a wide variety of kitchen tools and flatware, each set is molded with a different type of opening to accommodate the size and shape of the tang of the particular utensil for which the handles are intended.

According to St. Clair Plastics, the precision required in molding these openings called for special attention in the mold design. Should any opening be even slightly off-center, the tang would likewise be displaced and the assembly would be worthless. In the St. Clair operation, side draw core pins are used to mold the openings. As the mold closes, the pins automatically extend out into the center of the mold cavities. The plastic material flows around the pins and is allowed to set. At the end of the cycle, the pins automatically retract into the sides of the mold, permitting removal of the shot from the mold.

Rapid set-up of Hercocel W in the mold permits a cycle of approximately 2 min. to be used without distorting the openings in the top of the handles when the side core pins are withdrawn. Cylinder temperature is between 450 and 500° F. and mold temperature is about 170° F.

Finishing Operations

When removed from the mold, the shot is placed in a 140° F. quench bath for about 4 minutes. At the end of this time, it is taken out of the bath, sprues and runners are clipped off, and the handles are passed on to an inspection department where each opening is tested on a go no-go gage to ascertain whether it falls within the required tolerances. Final finishing operations consist of buffing and polishing.

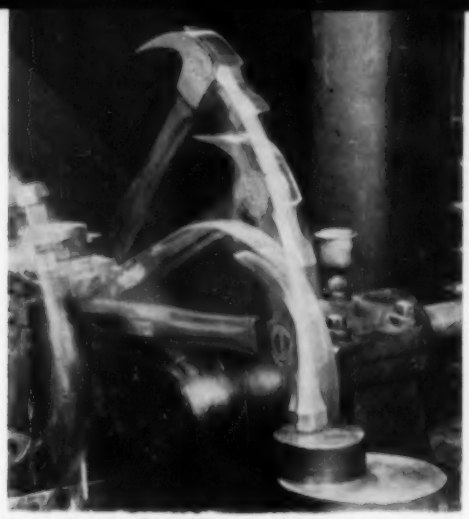
At the present time, the handles are being molded in forest green, grey, chartreuse, and coral colors designed to blend with the colors currently popular in quality plastic dinnerware.

Other Applications

The same advantages which make Hercocel W so suitable for use in cutlery and kitchen tool handles—heat resistance, low moisture sensitivity and good dimensional stability, toughness, high-gloss surface, and rapid set-up in the mold—have also opened excellent opportunities for the cellulosic in the molding of a wide variety of products, including dinnerware, pen and pencil barrels, combs, clock cases, radio housings, telephone parts, toothbrush handles, vials, camera cases, knobs, machine keys and oil containers.

In table setting illustrated below, both cutlery handles and dinnerware are molded of improved acetate material, are tough enough to withstand chipping, cracking, and breakage in normal usage

All photos with this article courtesy Hercules Powder Co.



Courtesy Monsanto Chemical Co.
In strength test, reinforced plastics handle withstood over 2 million blows without failure

Whole tool field may be opened to reinforced plastics by

History-Making Hammer Handle

Molded polyester-glass hammer handle is stronger than steel, superior to hickory

Courtesy Owens-Corning Fiberglas Corp.

FOR 99 years, Fayette R. Plumb, Inc., Philadelphia, Pa., has been making quality hammers, sledges, axes, and other tools with shock-absorbing hickory handles. And of all Plumb tools the most widely used is the carpenter's claw hammer—especially since the boom in the do-it-yourself market.

Wonderful stuff, hickory. But still it has certain drawbacks: under enough punishment it could split, a hammer head could loosen.

The Plumb organization sought a hammer handle material that would be superior, not only to hickory, but to any other material. The proposed new handle had to have the shape and resilient feel of hickory, a weight suitable for the purpose, colorability, great strength, weather resistance—in short, almost indestructability.

More Than a Lifetime

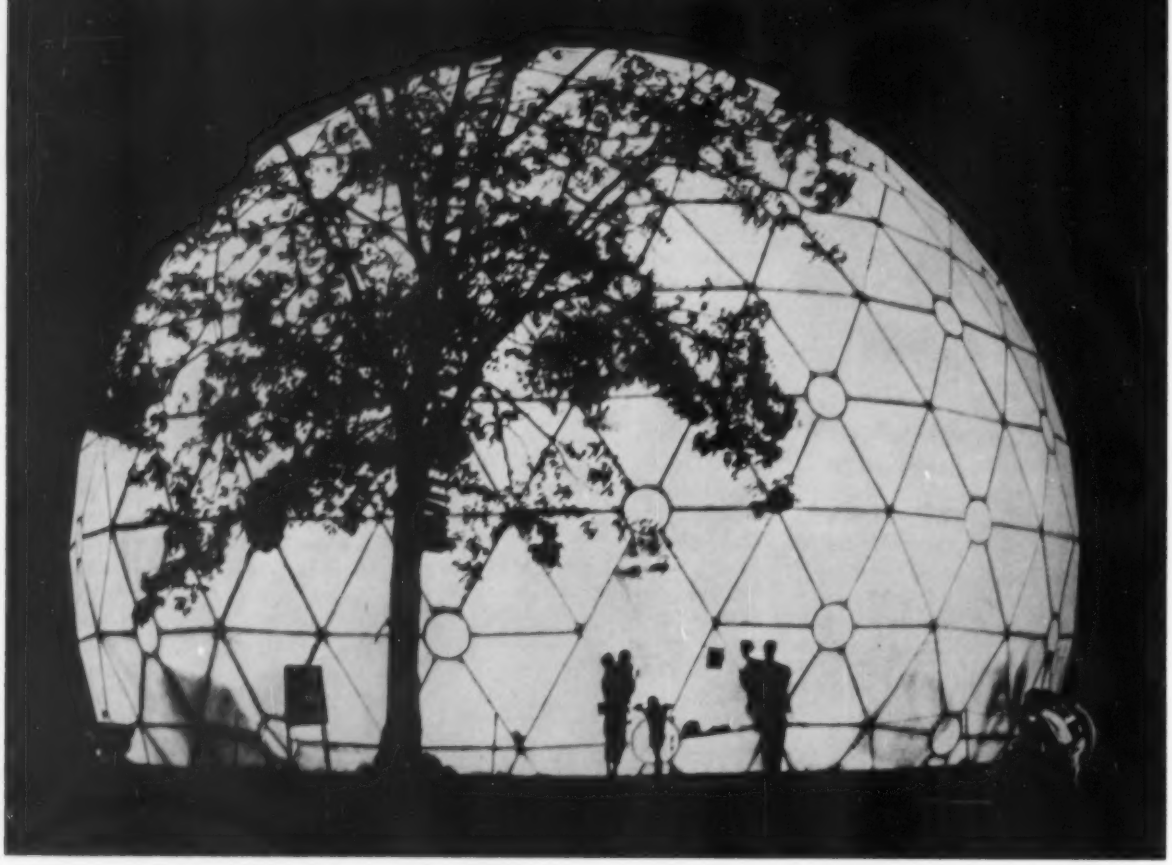
Fibrous glass-reinforced polyester plastics were found to be the answer. Over 1000 test hammers were produced in experimental molds and "given the works" under tortuous conditions in all climates.

In flexural strength the reinforced plastics handle is twice as strong as a solid steel handle and 61.5% stronger than a tubular steel product. Compressive strength is sixteen times that of tubular steel handles tested—the new handles took an applied load of 20,000 pounds. One hammer was fitted into a machine striking 6000 54-lb. blows per hr., or 2,016,000 blows day and night over a two-week period—considerably more than needed in the lifetime of a hammer. A carpenter would have to work 700 8-hr. days, driving a nail every 10 sec. to duplicate this test.

The handles are molded by Molded Insulation Co., Philadelphia, Pa., from a special polyester-impregnated glass roving produced by Plumb Chemical Co., a subsidiary of the hammer manufacturing concern. So dense is this material that each handle contains two million strands of glass. Molding is done under relatively high pressures in hardened production steel molds made by Stokes-Trenton, Inc., Trenton, N. J., and also by the tool shop of Fayette R. Plumb, Inc.

In the Plumb plant the handles are affixed to the hammer heads by a chemical weld that defies any abuse.

"Stronger than steel—with a hickory feel," the new hammer handles are living up to their test promises and are expected to lead reinforced plastics into a broad range of similar applications.



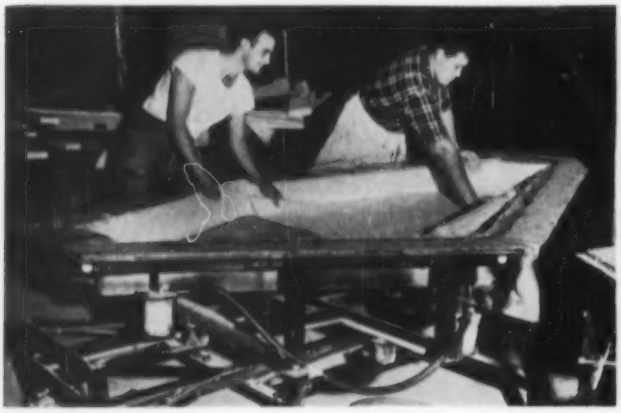
Lighted on the inside, geodesic dome constructed of translucent glass-reinforced polyester panels presents striking appearance

The BIGGEST Thing in Plastics

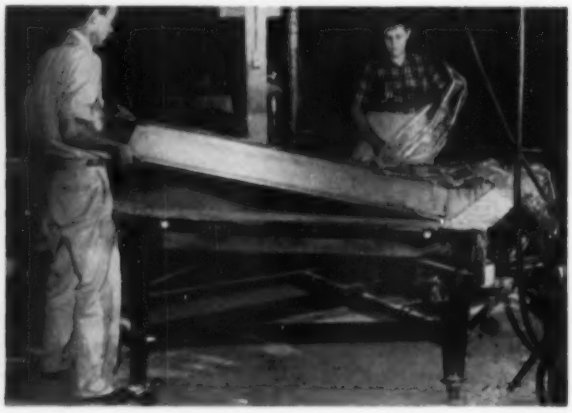
Geodesic structure, 55 ft. in diameter and 38.5 ft. high,

will withstand stresses set up by any environment

Fibreus glass mat is laid into mold of one of the 361 parts for geodesic dome. Vacuum jars in foreground are used to collect excess resin



Finished geodesic dome component is removed from mold, ready for trimming operation. Operator at right is stripping off bag



Photos courtesy Lunn Laminates Inc.

Geodesic dome structure nearing completion. Workman is securing fibrous glass-reinforced plastics panels in place

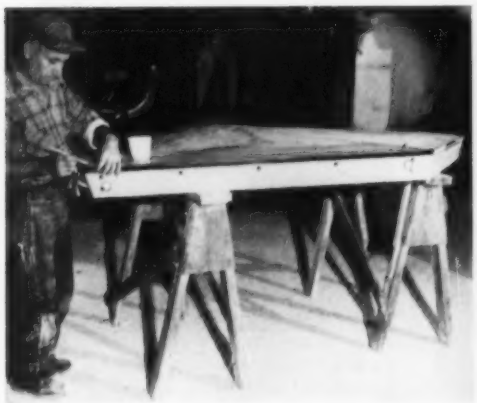
The basic idea of a geodesic structure is not new, and the building of geodesic structures with metal or wooden frameworks and plastic skins has been going on for some time. In the February 1955 issue of MODERN PLASTICS was described a Canadian barn constructed by Fuller Research Foundation of Canada, using a laminated wood framework and reinforced plastic panels; a wooden geodesic unit covered with a Mylar skin has received much publicity.

This architectural principle, which has received its greatest impetus in application by its inventor, Dr. R. Buckminster Fuller, president of Geodesics, Inc., Cambridge, Mass., involves the use of a three-way grid of great circles on a sphere whereby the engineer can work out the shortest possible lines of force with radial spokes stretching out from hubs to be locally surrounded by tension rings which are the aforementioned great circles. This principle provides for the strength of a sphere or a dome to be entirely in its surface.

An ambition of many architects—

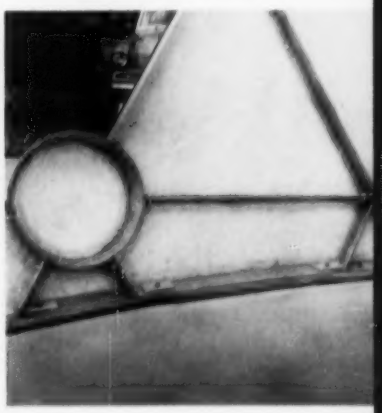
(*To page* 222)

After part is trimmed and sanded, a rubber gasket is bonded in place around its outside perimeter



Workman standing atop scaffolding bolts sections of dome together

Close-up showing how footing elements attach to concrete base



POLYETHYLENE Grabs the Spotlight

Second of two articles surveying the polyethylene situation, especially as it will be affected by new production methods

WATCHING the polyethylene parade, many bystanders have become so enamored by the big, flashy bandwagon where the drums are beating loudly for low-pressure polyethylene that they have almost forgotten the main part of the parade where most of the action is taking place.

People often become so "nuts" over something they haven't got that they fail to appreciate what they have on hand. What they have on hand in this case are high-pressure polyethylenes that are growing in volume and diversity of uses at such a fast rate that they could easily take the lead over all other plastics in the next three or four years, even without the low-pressure polyethylenes. Furthermore, this growth has been marked by such a variety of new and improved formulations that polyethylene will soon be running for the title of "Most Useful Plastic."

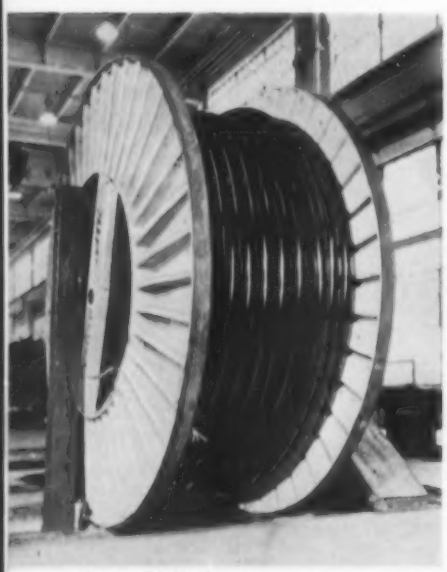
Estimated consumption of polyethylene for the first six months of 1955 is approximately 160 million pounds. For comparative purposes, estimated consumption of other leading plastics for the same period is 220 million lb. for all phenolics; 250 million lb. for all vinyl chlorides; and 195 million lb. for styrene-type molding and extrusion materials.

Estimated consumption for polyethylene in the entire year of 1955 is somewhere between 330 and 340 million lb. if the rate continues as indicated by Tariff Commission figures.

In-place capacity of the industry is now somewhere around 475 million lb. a year or about 40 million lb. a month, but that figure needs explaining. It represents a little more than the total announced capacity of all companies that have high-pressure plants. It does *not* include the 60 million-lb. Bakelite plant at Torrance, Calif., which will come on stream next year, and the 100 million-lb. Du Pont addition about which the company is uncommunicative. However, the 160 million lb. or so of polyethylene consumed in the first six months of 1955 are made up primarily of shipments by Bakelite, Du Pont, and Eastman Chemical.

Production Stages

The new producers who have come on stream this year have come into production by stages, as all



Courtesy Bakelite Co.
Sheathing for telephone cable represents growing market for polyethylene

Polyethylene collapsible tube makes handy package for shoe polish
Courtesy Bakelite Co.

Courtesy Du Pont
Molded polyethylene flashlight case is waterproof, will not corrode

Four-color plates courtesy Du Pont

Colorful display of polyethylene housewares in a variety of shapes and sizes is indicative of the multitude of uses to which the material is being put in today's home

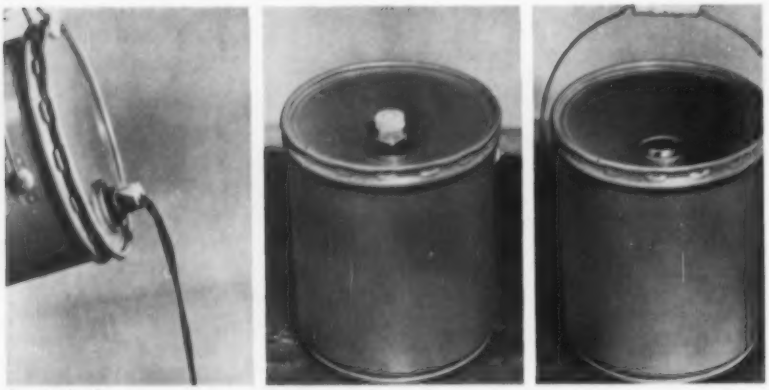
polyethylene producers have in the past, and are not believed to be near capacity production as yet. General procedure is to start with pipe-grade extrusion resin and then gradually work into production of molding, film, and electrical-grade formulations. It seems as though at least four to six months elapse after a plant comes on stream before satisfactory film-grade resin can be expected. Sometimes the time lapse is much greater. Electrical-grade resin is also apparently more difficult to produce and thus takes even more time to develop than film grade.

The market has developed so fast that there has been considerable scurrying around to keep ahead of demand for film-grade and some types of molding-grade material. The new producers should be in a better position to provide more material in the last six months of 1955, but there is considerable doubt that any of them will arrive at their announced capacity rate before 1956. Film-grade resin, in particular, is not expected to be available in much greater quantity by the end of this year than it is right now, and demand for it is far greater than for any other polyethylene formulation.

1956 Capacity

By next year the new producers should be ready to operate at capacity in all grades. In addition, there will be the above-mentioned 60 million-lb. Bakelite plant in California; Koppers' sizable semi-works plant for their new Super Dylan high-modulus Ziegler-type material; and Phillips' new plant for Marlex. Various pilot plants for low-pressure polyethylene are also scheduled to start production late in 1955 or some time during 1956.

If everything goes according to present hopes, including the ex-



Courtesy Du Pont

Flexibility and chemical resistance of polyethylene are used to advantage in molding a removable cap and retractable spout for pouring liquids from covered pails

Courtesy Bakelite Co.

Unbreakable mixing bowls made of polyethylene (some with scalloped edges for greater ease in handling) are finding increasing acceptance with the busy homemaker

Courtesy Bakelite Co.

Polyethylene film, which is tasteless and odorless and has low moisture vapor transmission, is ideal for poultry wrapping uses

pected but officially unannounced 100 million-lb. Du Pont addition and the recently announced W. R. Grace plant, production capacity by the end of 1957 will be something like 800 million pounds. However, this does *not* include several firms who have not yet made announcements, nor does it include the Monsanto addition which is to be built as soon as practicable. And perhaps an even more startling fact is that only three low-pressure plants (Koppers, Phillips, and Grace) with a total volume of less than 200 million lb. annual production are included in that 800 million lb. figure. The first half of this article pointed out that nearly every high-pressure polyethylene producer is also expecting to build a low-pressure plant, but not one expects to curtail its high-pressure operations. In addition, companies like Hercules and Goodrich-Gulf, no strangers to plastics, also expect to get into the business.

In any case, the industry has now reached a point where it can consume about 30 million lb. a month. As noted above, it won't be long before 40 million lb. a month is available. Demand and use for polyethylene is expected to grow at a faster rate than any other plastic, but considerable sales effort will be required to move that additional 10 million lb. a month.

Growth Measurements

Past measurements of growth are meaningless in forecasting the future of polyethylene. The material has been scarce until the last 10 or 12 months; consequently, no one can anticipate the pattern which will emerge when a supply sufficient to meet all demands is available and

In the accompanying article, *Modern Plastics* presents the second half of a survey of what's happening to polyethylene. The first half, published in the September issue, was devoted largely to information on the development of the "low-pressure" materials. The second half gives estimates on production and sales of polyethylenes for 1955, points out areas of possible growth, and further analyzes the overall competitive picture.

new markets can be developed. Present indications are that 1955 consumption increases will be 60 or 65% over 1954. If the increase in 1956 is 50%, the amount consumed would be close to 500 million lb. or over 40 million lb. monthly.

No one yet dares to guess when the rapidly climbing sales curve will start to level off. But there are some boards of directors who are a bit nervous about the ever-growing list of competitors and are wondering just how far this mad scramble to get on the bandwagon can continue before somebody gets pushed off the overcrowded seats. And behind this wonderment is constant questioning on how the new low-pressure polyethylenes are going to affect the all-around progress of the polyethylene industry.

Increases in Every Use

Division of this year's polyethylene consumption into its various uses is expected to make about the same pattern as last year. Perhaps one of the most optimistic notes for the future is that increases are expected in every use.

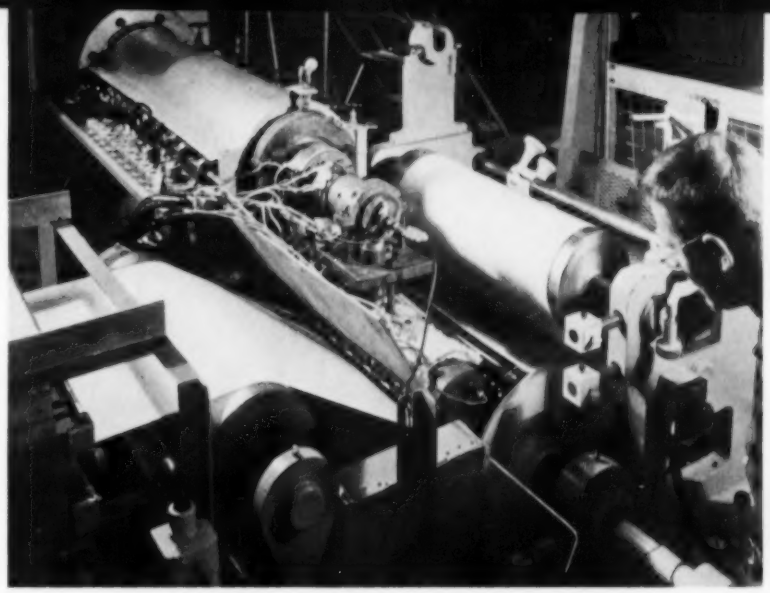
Based on the first six months consumption, a rough estimate on how polyethylene will be split up according to end use in 1955, in millions of pounds, is as follows:

End use	*1955*	*1954*
Film and sheeting	120	70
Molding	60	34
Wire cable insulation	35	29
Pipe	28	22
Coatings	25	20
Bottles	9	7
Exports	30	12
Miscellaneous	23	13
	330	207

Film and Sheet

Film and sheeting is by far the largest consumer of polyethylene and probably will remain so for years to come. Packaging probably consumes at least 60% of all polyethylene film today, but there are other possibilities that could also reach the "millions of pounds" classification. One is film as a moisture barrier for basements and walls in the construction industry. Advocates of low-pressure material claim that 2-mil low-pressure film for this purpose would be as efficient as 4-mil high-pressure film, and less costly.

Then there is the agricultural field where film can be used between rows of crops to retain moisture and



Combination extrusion-coating equipment has made polyethylene-coated paper a practical application, with potential end-product market of millions of dollars

Courtesy Farbwerke Hoechst A.G.

Articles injection molded from German low-pressure, pilot-plant polyethylene material exhibit outstanding stiffness, high gloss, and good heat resistance properties

Diaper hamper is fabricated of polyethylene-surfaced fibreboard; removable polyethylene bag is hung inside

Courtesy Robert Gair Co., Inc.

Coating inside of paper carton with metallized polyethylene makes it moisture- and greaseproof

Courtesy Robert Gair Co., Inc.

Courtesy Bakelite Co.

Over 1500 nautical miles of polyethylene-insulated cable are being coiled in tank of *H.M.T.S. Monarch*. Cable is for underwater application in South Atlantic

subdue weeds, as well as for ground silos, irrigation ditch liners, fumigation beds, greenhouses, etc.

Other big potentialities are in large-size coverings for furniture and machinery that is temporarily out of use, for painters' drop cloths, and for scores of other things used indoors. The material can be made equally available for outdoor use when carbon black is added.

Courtesy Bakelite Co.

Single-portion mustard dispenser of polyethylene is unaffected by acids

Odd uses in the packaging field crop up almost every week. A newspaper publisher delivered a special edition in re-usable waterproof polyethylene bags. A New York apple grower prepackaged 75,000 bushels in 5-lb. polyethylene bags. A potato grower licked the low-price potato debacle by packing clean, uniform size tubers in 10-lb. transparent bags that wholesaled for 40¢ against 30¢ for 15 lb. of standard pack. Cornell University reports that plastics packaging caused a 100% increase in apple sales and that 70% of New York apples were prepackaged by the farmers themselves.

Film for camelback and other uses in the rubber tire industry was one of polyethylene's early uses. It is now so big that one of the rubber companies, which is also a major extruder of polyethylene film, is itself consuming all it can make.

Textile Applications

Film as a replacement for textiles for tablecloths, drapes, raincoats, and the like is moving in good quantity but has not yet received the blessing of polyethylene producers. They claim its mechanical properties are not particularly suited for textile-like applications. It does not have the right hand, drape, or strength, does not take textile printing easily, and may be a bit "tinny."

Nevertheless, it seems a foregone conclusion that sooner or later polyethylene film will march into that field in tremendous volume because of its low cost. For example, Woolworth is marketing a 2-mil vacuum-embossed tablecloth in millions of units at less than $1.00 each, and what Woolworth does others will attempt to duplicate. Low-cost drapes are on the market in fair volume. Several of the largest vinyl film producers have installed large-scale polyethylene extrusion equipment. They advertise their polyethylene product for packaging, but they have always been in the textile business, and it is logical to believe that they have their eyes on any possible outlets for polyethylene film in that industry.

Calendered Film

In another approach toward film production, a vinyl film producer has been calendering polyethylene film for several months. Another firm is reported to be on the way toward the same objective. What this means for large-scale production is still a matter of conjecture. Film less than 3 mils thick is difficult to produce on the big vinyl calender; the pressure involved is simply too great for thinner film. If the finished material is used for drapes, tablecloths, or rainwear, it has a propensity to pick up dust particles and looks dirty or greasy. It is also too "papery" for such applications. When it is pulled, the material flows something like cold molasses and doesn't come back quickly like vinyl.

Even if there were none of these problems, the economics seem bad. A company that is already in the calendering business may some day find it practical to add polyethylene to its line, but no company would be expected to set up a new $1 million calendering line when it can get into the polyethylene business with a $20,000 extruder and gradually increase in size as needed.

But despite the lack of enthusiasm shown for calendered polyethylene, there is one large-scale operation whereby 18-in. wide film is calendered and coated with adhesive and sold in that width or cut into various

(*To page* 224)

International Plastics Meetings

Meeting of ISO/TC 61

Technical Committee 61 on Plastics of the International Standardization Organization (ISO/TC 61) held its fifth meeting in Paris at the Maison de la Chimie on July 8-13, 1955. Seventy-two delegates and experts representing the following countries were present: Belgium (3), Czechoslovakia (1), France (14), Germany (8), India (1), Italy (8), Netherlands (4), Sweden (9), Switzerland (5), United Kingdom (9), and United States (10). Dr. G. M. Kline, National Bureau of Standards, presided as chairman, with J. Duval of the French Standards Organization (AFNOR) as co-chairman. N. A. Skow, representing The Society of Plastics Engineers, Inc., as well as Synthane Corp., served as secretary, assisted by Mrs. Charreyron of Centre d'Etudes des Matières Plastiques. J. W. McNair represented the American Standards Association, which acts as the Secretariat of ISO/TC 61.

The complete roster of the American delegation was as follows: Robert Burns (leader), National Research Council; C. Howard Adams, Monsanto Chemical Co.; W. A. Franta, E. I. du Pont de Nemours & Co., Inc.; G. M. Kline, National Bureau of Standards; J. W. McNair, American Standards Association; Norman A. Skow, Synthane Corp.; R. R. Winans, Materials Laboratory, New York Naval Shipyard; Ralph K. Witt, John Hopkins University; E. Y. Wolford, Koppers Co., Inc.; E. E. Ziegler, The Dow Chemical Co.

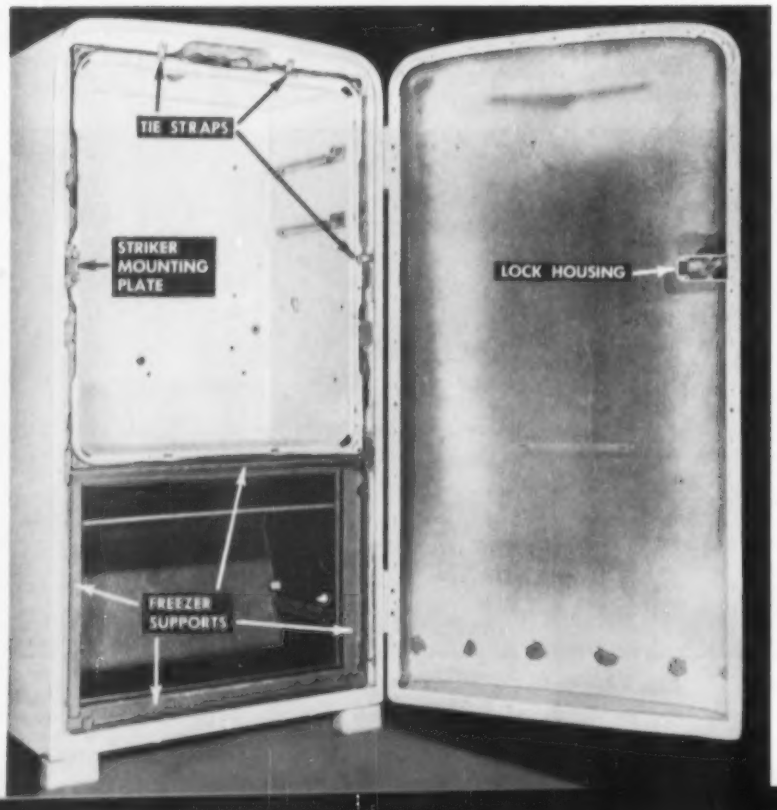
Notable progress was made in the standardization of nomenclature and testing methods for use in international trade by the eight Working Groups of the committee. Ten Draft ISO Proposals were approved for circulation to the participating (14) and observer (16) member countries of ISO/TC 61. These proposals dealt with a list of equivalent terms pertaining to plastics in English and French and with test methods for the determination of flexural properties of plastics, melt flow index of polyethylene, bulk factor of molding compounds, qualitative detection of free ammonia in phenolic moldings, amount of styrene in polystyrene, viscosity of polyvinyl chloride solutions, resistance of plastics to chemicals, volatility of plasticizers from plastics, and migration of plasticizers in plastics formulations.

Four Draft ISO Proposals that had been reviewed by the ISO/TC 61 members prior to the meeting were approved for circulation by the ISO Secretariat (Geneva) to all ISO member countries for consideration for advancement to the status of ISO Recommendations; these pertain to methods of test for methanol-soluble matter of polystyrene, free phenols in phenolic moldings, quan-

(*To page* 246)

Representatives of the French plastics industry, delegates, and their wives at banquet held in honor of ISO/TC 61 in Paris. The banquet, one of the events of the fifth meeting of this organization, was addressed by Prof. Léon Jacqué and Dr. G. M. Kline

New Structural Strength



MOLDED reinforced plastics are moving into an important new position in the refrigeration field, as exemplified by the current production program of Kelvinator Div., American Motors Corp. The extremely high strength characteristics of molding compounds based on polyester resins and fibrous glass in short lengths or mat, coupled with good thermal insulating properties, freedom from corrosion problems, and other desirable features, are winning an increasingly important place for such parts in the newest Kelvinator refrigerators and freezers.

Although for a number of years Kelvinator, along with other refrigerator manufacturers, has been an important user of various plastics for inner door liners, door shelves, breaker frames, crispers, and other components, only recently has the company begun turning out reinforced plastics lock housings, tie straps, striker mounting plates, and other parts of an essentially structural nature. Currently, this new Kelvinator program involves the production of approximately 10,000 parts per day, including more than a dozen types of components. Now that the basic experimental work has been completed and the necessary equipment installed, it is stated that the program will be considerably expanded in the future.

It was approximately two years ago that Kelvinator began to investigate the possibility of utilizing fibrous glass-reinforced molding compounds for certain highly stressed refrigerator parts. In its preliminary experimental program, Kelvinator did extensive work with molding compounds based on polyester resins reinforced with chopped glass fibers

Displayed in front of refrigerator in which they will be used are nine components molded of reinforced plastics (top photo). The parts arranged in the shape of a frame are the four freezer supports; parts within the frame are (left to right) striker mounting plate, three tie straps, and lock housing. Locations of these components after they have been installed in the appliance are indicated in bottom photograph

Photos courtesy Kelvinator Div.

in Refrigerators

Kelvinator uses reinforced plastics for highly stressed parts

which also provide thermal insulation and freedom from corrosion

and on glass mat impregnated with the same type resins.

The first part to be made was a door striker mounting plate. After mixing numerous batches of experimental material and arriving at the proper formulas and molding techniques, Kelvinator installed a battery of five modern compression presses at the Grand Rapids plant, so that the new structural parts could be produced under the company's direct control.

Illustrated in accompanying photographs are some of the structural refrigerator parts which Kelvinator is now molding under this new program—all of them "direct descendants" of the original striker mounting plate. Some of these components are made in several sizes and types to fit different models. The parts range in size from 1 in. in length to as long as 30 in. or more, and in weight from a fraction of an ounce to 24 oz. or more.

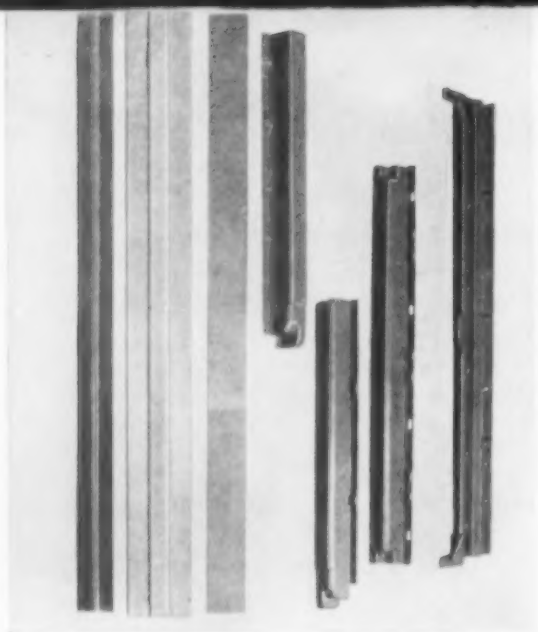
From the performance standpoint,

Typical structural refrigerator components now being molded of reinforced plastics include *A*—diagonal anchor; *B*—lock housing; *C*—drain stop; *D*—tubing and wire retainer; *E* and *F*—plate assembly and striker mounting plate with metal inserts; *G*—rear tie strap; *H*—tie straps; *I* and *J*—latch housings, with molded nylon catch installed in *I*

Photos courtesy Owens-Corning Fiberglas Corp.

Reinforced plastics lock housings for refrigerators are produced in a six-cavity mold on a 200-ton compression press (right). While molding cycle is in progress, operator weighs up preforms of premix material before placing them in mold for next cycle

At end of molding cycle, operator opens press and removes lock housings. These parts are molded with six blind cores into which self-tapping screws are driven on the assembly line, eliminating tapping operations formerly required with metal lock housings



Tie straps, plate assemblies, and freezer supports are cut from continuous molded strip of proper cross-section

Operator feeds molded strip into machine from right; machine cuts strip into tie straps and punches mounting holes in them

Courtesy Owens-Corning Fiberglas Corp.

Kelvinator's use of reinforced plastics parts is based upon their superior characteristics as compared to their earlier counterparts, most of which were made of metal. A primary advantage of the plastics parts, in addition to their strength and resistance to breakage, is the fact that they cannot rust or corrode, do not absorb or transfer food odors, and have excellent thermal insulating properties. This latter quality means that the plastics structural parts will not impair the efficiency of the refrigerators by conducting heat into the food storage compartment or freezer compartment. The plastics parts maintain an effective "thermal break" between the outer shell and the inner compartment of the appliance.

Another important advantage of the reinforced plastics parts is the fact that some of them eliminate or greatly simplify manufacturing operations. Prior to adoption of the plastics parts, some of the metal components used involved the fabrication and assembling of a number of individual parts at relatively high cost. For example, with the previous type of fabricated metal lock housing, an assembly of several component parts was involved. These parts required metal forming, bonderizing, painting, and the use of a plastic thermal insulating spacer between the housing and the inner door panel. In addition, this component required a tapping operation so that it could be bolted into place in the assembly. By contrast, the new molded reinforced plastics lock housings, made in one piece, are molded with blind cores into which self-tapping screws are driven on the assembly line. Since the entire part serves as a thermal insulator, no additional spacer is needed.

Mold Charges Preweighed

These lock housings, as made by Kelvinator, are produced in a six-cavity mold in a 200-ton compression press. While the molding cycle is in progress, the operator weighs up enough of the glass-reinforced polyester compound for the next cycle. Finished parts, upon removal from the mold, are cleaned of rough flash and placed in a tote box mounted on a skid for convenient removal at frequent intervals.

The same type of molding procedure is used for a number of the other parts, utilizing preweighed charges of the molding material. Another typical part—a striker mounting plate—is produced in a 20-cavity die, mounted in a 250-ton compression press. Formerly, this part was blanked from continuous molded strips having the required profile, until the present design, more adaptable to individual molding, was developed.

Blanking and Piercing

There are a number of Kelvinator reinforced plastics parts that are made by this technique of cutting off individual pieces from continuous molded strips having the required cross-section. The plastic will withstand blanking and piercing operations without splitting or cracking, and the technique lends itself especially to parts which are essentially flat and have a uniform cross-section in one dimension.

For example, Kelvinator makes extensive use of this method in producing such components as tie straps, which are used to tie together the formed steel outer cabinet of the refrigerator and the inner cabinet. For maximum efficiency, the straps must be made of a thermally nonconducting material to maintain a temperature break between the inside and outside of the appliance. Several shapes and sizes of tie

Courtesy Owens-Corning Fiberglas Corp.

Rope-like, continuous lengths of polyester-fibrous glass premix (circle), shown emerging from special extruder unit at left, are used to expedite the molding of certain reinforced plastics components for refrigerators

straps are used by Kelvinator for different models.

First step in the production of the tie straps consists of molding reinforced plastics sheets measuring approximately 1 ft. wide and 30 in. long, utilizing glass mat impregnated with polyester resin. Actually, these sheets consist of several strips having the required cross-section, arranged side by side and molded so that they can be easily separated after molding. Following separation, the strips are fed endwise through a blanking operation where the individual tie straps are rapidly cut off and simultaneously punched with mounting holes. This makes for an efficient, high-production type of operation.

A somewhat different approach is utilized in molding such parts as tube retainers, which are used on the back of the refrigerator as mounting supports for the metal tubing which carries the refrigerant fluid. These parts are produced by Kelvinator in an 18-cavity mold, designed with the cavities in chain fashion, closely spaced, in three rows of six cavities each. The cavities are not loaded with individual charges of molding material; instead, three rope-like strips of the material are laid parallel in the mold. Individual tube retainers are separated from the continuous strips at the end of the cycle.

Piston Extruder

Kelvinator produces the preform strips of molding material by means of an extrusion process, utilizing a specially built piston type extruder. The premix material is fed into a hopper at the top of the unit and the rope-shaped strips of molding compound are forced out through a die in a purely mechanical extruding operation in which no heat or cure is involved. This process may be used in the production of long, slender parts or others whose shape permits the use of closely connected cavities.

As part of its continuing improvement program on the reinforced plastics parts, Kelvinator conducts constant tests on flavor transfer, insulating characteristics, and other properties of the molded components. Automatic door slammers subject parts to "million slam" tests which prove their ability to withstand even the most punishing type of service. Many other types of tests are also carried out to make certain that Kelvinator's new plastics parts will measure up to requirements.

Striker plate (above) and freezer supporting strips (below) are installed on refrigerator at fast production pace by operators using power screwdrivers

Photos courtesy Owens-Corning Fiberglas Corp.

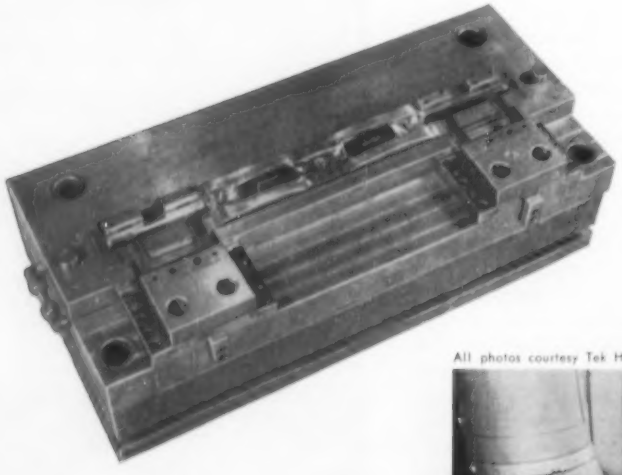
Flexible Hairbrush Features Plastic Springs

Resiliency of molded nylon bands that hold acrylic parts of brush together makes possible a new type of brush action

Recent addition to milady's beauty arsenal, acrylic and nylon hairbrush back has been subjected to flex tests simulating 16 years' normal use without sign of wear

NEWEST thing in hairbrushes for women has been made possible by a happy combination of molded acrylic and molded nylon. This brush, because of its flexible back, follows the wave of the hair and gives more effective grooming to the hair and scalp through a stimulating tugging action.

Flexibility of the new brush, fully covered by patents, depends upon two molded nylon "springs" which hold together five acrylic parts—the



Brush handles are produced in two-cavity mold. Slots in handle, through which nylon bands pass to hold brush back together, are made by movable mold cores

All photos courtesy Tek Hughes Div.

After molding, center sections are placed in jigs on revolving table of automatic shaping machine. Revolving knives cut off those parts of gate not removed at molding machine and also shape ends of handles

handle and two separate sections on each side of the handle. The nylon springs pass through molded-in slots in the acrylic pieces and are, in turn, held in position by the stapled brush bristles.

Flex Tests

Tests made on pilot models showed that properly molded nylon springs could be flexed on an automatic bending machine 5,000,000 times without breakage. More recently, production brushes have been successfully bent over 600,000 times without a sign of wear. When it is realized that 600,000 bends are the equivalent of over 16 years of normal usage, it becomes evident why no attempt has been made to carry the testing further.

Molding

The brush back sections are molded from a crystal acrylic stock which was chosen for its clarity, brightness, and good molding qualities. Directly above the molding machines, on the second floor of the building, is the drying room where the acrylic molding compound is stored and dried before being fed into the hoppers. The drying ovens are of the trayed, electric, hot air type which dry the material at a temperature of 160° F. for three hours. When the molding machine operator requires additional molding powder, the drying room is signaled and two trays of material are dumped into the hopper.

The brush handle, which incorporates the center bristling surface, is produced in a two-cavity mold; the four side sections are molded in an eight-cavity family mold. All the molds are cored to produce the assembly slots in the pieces.

The springs or nylon bands, which must meet exceedingly close tolerances, are produced in an eight-cavity mold; molding material is first dried for 6 hr. at 175 degrees. It has been found that maximum flexibility, which is of the greatest importance in the springs, can be obtained by running cold water through the mold during the molding process. The gates of the springs are removed by the molding machine operator with a cutting die.

Polishing

The springs and the side sections of the brush block are then delivered to the assembly table. The center sections are placed in jigs on the revolving table of an automatic shaping machine where revolving knives remove that part of the gate not taken off at the molding machine and also shape the end of the handle.

When this shaping is completed, the center sections are polished and buffed on a high speed buffing disk, one side of which contains a fine abrasive, the other polishing wax. The center sections then join the springs and side pieces at the assembly table.

Assembly

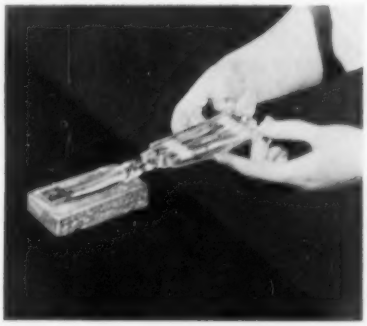
Here the center section is placed in a jig and the nylon springs are inserted in the slots. The four individual side pieces, which are numbered in the mold to facilitate assembly, are then placed on the springs. Here is where the need for precision molding of the nylon bands becomes apparent; they must hold the sections of the brush together until the bristling process is completed.

Delivered to the bristling machines packed in tote boxes, the assembled brush block is placed in a chunk on a Carlson type bristling machine. Guided by a templet, one side of the machine drills the bristle holes while the other side inserts the nylon monofilament bristles and staples them securely in place. The tufts of bristles extend through the nylon springs and are imbedded firmly in the brush block.

The brushes are individually packed in polystyrene re-usable vanity boxes which have a diagonally cut, hinged crystal top and a mother-of-pearl bottom. A self-locking clasp holds the top securely closed and the manufacturer's logo is gold leaf-stamped on the top.

CREDITS: Brush, known as "Flex-Action by Hughes for Women" is produced by Tek Hughes Div., Johnson and Johnson, through its manufacturing company, Autograf Brush and Plastics Co., Watervliet, N. Y. Materials are Du Pont Tynex nylon and Lucite HM 130. Drying ovens are made by Brosites Machine Co., Inc., New York, N. Y. Nylon springs are molded on a 3-oz. Fellows injection machine; the acrylic parts are produced on 16-oz. Lesters. Automatic shaping machine used for degating is made by Onsrud Machine Works, Inc., Chicago, Ill.

Operator places center section of brush in jig, runs nylon bands through molded-in slots



With grip end of brush held securely in place, four individual side pieces are put on bands

Bristling machine drills bristle holes and inserts nylon monofilaments to complete brush

What VINYL is Doing

AS THE trend towards automatic materials handling rolls into high gear, engineers are not only dreaming up new ways to move things by conveyor belts; they're even thinking up new items for belts to carry.

In many of these proposed applications, now being aggressively explored, the rubber compounds traditionally used in conveyor belts are not going to do the job—either because the belt surface may have an adverse effect on the materials proposed for belt travel or the materials themselves may attack the belt. And, in many instances, rubber belts present fire hazards that prevent their use on certain jobs.

Within the past two years, the most promising answer to these problems has come to light—the wedding of vinyl with conventional fabric belting. Even now, the progress taking place in this field is being watched with avid interest by the wide range of industries in this country—from bakeries to coal mines—that make use of conveyor belting to transport goods or materials.

At the present time, two types of vinyl belting, each with its own specialized advantages and each intended for a specific market area, are being promoted in this country—a reinforced vinyl-impregnated belt (a product of The B. F. Goodrich Co., Industrial Products Div., Akron, Ohio) and a vinyl-covered belt (a product of Scandinavia Belting Co., Newark, N. J.). The following articles outline the advantages and the end-use possibilities of each type.

Vinyl-Impregnated Belts

TO TAKE over at the point where rubber belts have failed in the performance of many specialized jobs, The B. F. Goodrich Co., Industrial Products Div., Akron, Ohio, has, within the past year, developed a reinforced vinyl-impregnated belt which is already at work on many operations once believed impossible to belt.

Goodrich's reinforced vinyl-impregnated belt has many special advantages to recommend it for a wide variety of applications. It has excellent resistance to abrasion; it resists alkalies; vegetable, animal, or mineral oils; greases; certain organic and inorganic acids; sugars; solutions of common salts; and fertilizers—and it has a low-friction surface that will not flake or strip off.

The smooth, non-porous surface of the vinyl-impregnated belt can be cleaned easily and quickly and can be colored as the application requires. (At the present time, Goodrich supplies its multiple-ply belts in tan and its single-ply belts in white.) When used for food handling, the belt will not contaminate the products being conveyed. And it can safely handle fine materials at temperatures from 50 to 150° F. (coarse or lumpy materials can be handled at higher temperatures).

In describing the construction of its new belt, Goodrich states that each of the fabric plies which make up the body of the belt is completely impregnated with Koroseal vinyl so that the properties of vinyl are present throughout the entire thickness of the belt. Thus, even though the belt is accidentally torn or gouged, the carcass is still protected from the effects of greases, acids, or oils.

When the carcass or fabric plies have been fully impregnated with vinyl, a 1/32-in. covering of vinyl is applied to both surfaces of the belt and the cover and plies are fused together under heat and pressure into a single solid unit.

The belts are made in slab form in widths up to 48 in. and can then be slit to the desired sizes. Belts can be spliced together endlessly by using metal fasteners or a heat-sealed splice. Edges are protected by a flexible vinyl coating.

Industrial Applications

The only type of belt of its kind on the market (as distinguished from the vinyl-covered belt described on p. 114), the reinforced vinyl-impregnated belt has already been accepted for a wide range of industrial conveying applications.

The belt can handle oily foods as efficiently as abrasive machine parts. Many companies are also using it where their operations require that the material carried be free of contamination. The tough, odorless, non-flaking cover of the belt has opened up many new belt conveyor applications where highest finished-product purity is required.

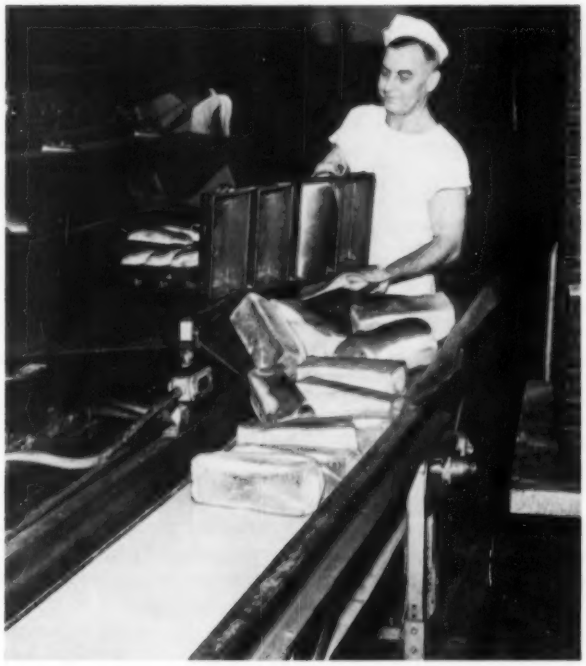
Some of the special applications to which the belt has been adapted illustrate its versatility. Koroseal belting, for example, as used in a spray booth at the trim plant of Ford Motor Co. in Detroit, is credited with a 30% decrease in the over-all maintenance operations needed on the belt used to convey trim panels through a booth where they are sprayed with a rubber dispersion latex to bind the parts together.

Before Koroseal belting became available, the build-up of the rubber latex on conventional belts was so rapid that it became necessary to resort to muslin protective belt sleeves. These had to be replaced every 4 hr., with a time loss of 35 minutes. Koroseal belting, by contrast, has completely eliminated the necessity for protective sleeves and for shut-downs. The smooth, non-porous surface of the belts permits the rubber latex to be easily peeled off. At the end of each 8-hr. shift, the excess latex is stripped off and each new shift starts with a clean belt.

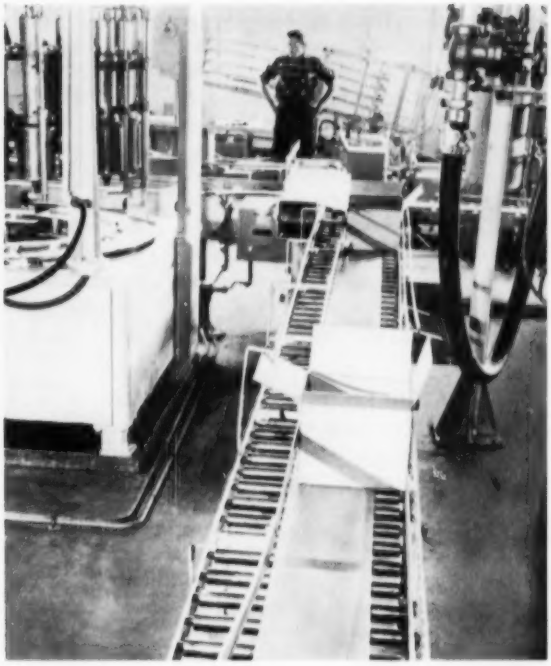
Light Industrial Use

Koroseal belting is also being used for light industrial purposes in a steel pulley manufacturing plant as

for CONVEYOR BELTS

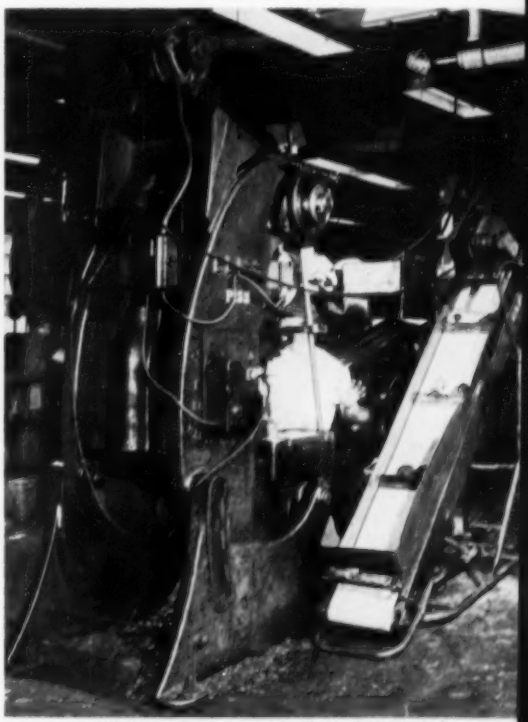


BAKED GOODS. Vinyl-impregnated belt for conveying bread resists fats, moisture, and cooking oil; it's non-toxic, does not impart taste or odor



PACKAGING OPERATIONS. Boxes, conveyed from loading point to gluing machine, can be stopped en route without stopping belt

AUTOMOTIVE PARTS. Used for conveying trim panels through spray booth, vinyl-impregnated belt reduces belt maintenance work 30 percent



LIGHT INDUSTRY. Bathed-in-oil steel pulleys with sharp edges are handled by vinyl-impregnated belt without detrimental effects on conveyor

Photos on this page courtesy The B. F. Goodrich Co.

part of an operation that is one of the most severe tests to which the belt could be subjected. Sharp-edged pulleys, bathed in oil (a natural enemy of other types of belts), are thrown onto the Koroseal belt following a machining operation. Oil also accumulates in bolt holes required for metal cleats which are attached to the belt. Belts previously used on this installation lasted two or three weeks before they deteriorated from the effects of abrasion and oil. The Koroseal belt has been on the job now for about 18 months and is still in service.

An additional advantage of the smooth, low-friction surface of the vinyl-impregnated belt is that it permits stoppage of material directly on the belt for loading, stamping, or inspection. The belt continues to slide under the stationary load without wear or severe drag being exerted on the belt surface.

To date, according to Goodrich, the belts have been designed and are being used primarily for lightweight food handling and industrial service. Heavier belts, however, can be made by increasing the number of plies and the thickness of the top vinyl covering. Such belts, as now being tested, will be ideal for heavy duty industrial applications (including the fabulous market for fire-resistant underground conveyor belting in coal mines) wherever the stimulus of automation has given birth to an operation requiring a tough, oil-resistant, abrasion-resistant, and easy-to-maintain conveying system.

Vinyl-Covered Belts

VINYL-COVERED belts, consisting basically of a solid woven fabric core to which a vinyl cover is applied (special equipment has been developed to fuse cover and core together using heat and pressure to obtain excellent adhesion) are relatively new to this country. The pioneer manufacturer in the United States, Scandinavia Belting Co., Newark, N. J., started initial production of vinyl-covered belting in March 1953.

While volume growth of the application has not had time to compare with its use overseas (especially in England), vinyl-covered belting in the United States has been showing a steady pattern of expansion. And Scandinavia feels that as soon as many of the test installations now being set up prove successful, the rate of growth can be expected to swing sharply upwards.

Underground Conveyors

Potentially, belting of this type looms as another large-volume market for vinyl in the belting field. In England, for example, where much of the initial development work on this particular type of belting was done, it is estimated that in 1954 over 15,000 tons of vinyl went into coverings for fabric belts installed as underground conveyors in coal mines—and this is only one of many possible end-use categories.

The switch from rubber to vinyl-covered belting in mines, however, stands out as the largest single factor contributing to the growth in the use of this belting in England. The major disadvantage of the rubber-type belting previously used was its

ELECTRIC ASSEMBLY. Vinyl-covered woven fabric conveyor belt provides excellent service on electric motor assembly line

LOADING AND UNLOADING. Weather and abrasion resistance makes vinyl-covered belt installation suitable for unloading sand, coke, etc.

susceptibility to fires caused by friction build-up on the belts which occurred when the belt would accidentally become jammed and the driving rollers would continue to rotate. Vinyl-covered belts, on the other hand, will not support combustion—an advantage which prompted the British National Coal Board to issue a report recommending that old-type rubber belting be replaced with the new type of belt.

In the mining industry in the United States, the introduction of vinyl-covered belting has barely commenced. For fire-resistant belting, the majority of manufacturers still use neoprene coverings which can be applied with the same type of processing equipment used for conventional rubber-type belting. Vinyl-covered belting requires a change in existing equipment.

However, vinyl belts have been experimentally installed in mines in this country and both belting manufacturers and the mining industry are keeping their eyes open for progress reports on these installations.

Advantages

The mining industry, however, while certainly large, is by no means the only outlet for vinyl-covered belting, nor is non-flammability the only major advantage of the belting. There are many, many jobs in general industry—from conveying sand in steel mills to conveying potato chips on an assembly packaging line—that vinyl-covered belting will do better and more economically than most other types of rubber belts.

Vinyl-covered belting has many inherent advantages, including:

1) excellent resistance to abrasion;

2) resistance to alkalies, dilute acids, most chemicals, mineral oils, sugars, solutions of most common salts, and fertilizers;

3) resistance to water (vinyl-covered belting can be washed with water, steam cleaned, or sterilized without damage);

4) good performance within a wide range of temperatures (Scandinavia's Scandura belting will operate at temperatures from −10 to 212° F. and special coatings are available for use at temperatures as low as about −50° F.);

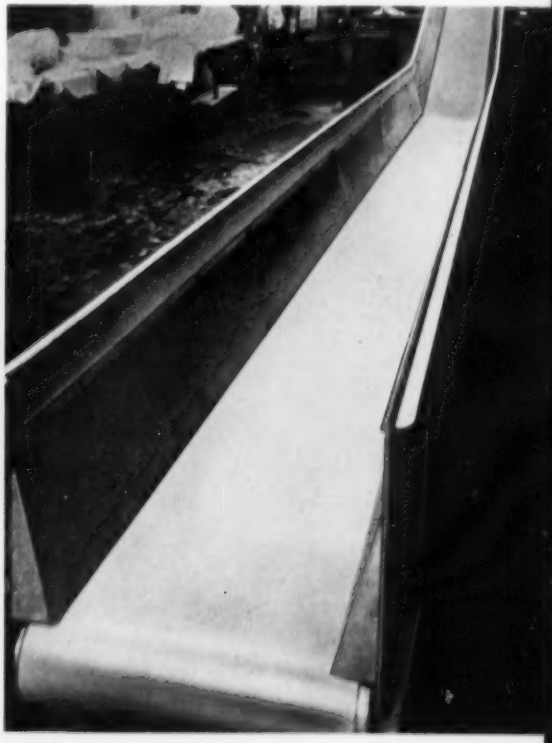
5) negligible stretch and shrink;

6) color possibilities (vinyl-covered belts have thus far been made in black and in a white which is recommended for applications involving the handling of food).

Scandinavia Belting Co. has already installed Scandura belting on the production and assembly lines of over 75 clay, brick, and tile plants, and is now promoting the product to those markets which its British parent company, British Belting and Asbestos Ltd., Cleckheaton, Yorkshire, England, has successfully hit. In addition to its extensive use in the mining industry, vinyl-covered belting is being used in England as portable brick conveyors, assembly conveyors, fish conveyor belts, food packaging conveyors, and as all-around conveyors for specialized jobs in both light and heavy industry. One unusual application which has proved popular in England is a laundry conveyor for sorting or classifying garments. Since the clothing which rides the conveyor is usually wet, waterproofness (as offered by vinyl-covered belting) is essential.

Scandura belting is available in widths from up to 42 in. and in thicknesses of from ⅛ to ⅜ inch. The core of the belting is a solid woven fabric in which the plies are actually interwoven. It can be coated either on only one side or on both, according to the specific requirements of the application.

LAUNDRY SORTING. Used to transport wet clothes in laundry, vinyl-covered conveyor belt is waterproof, has long service life

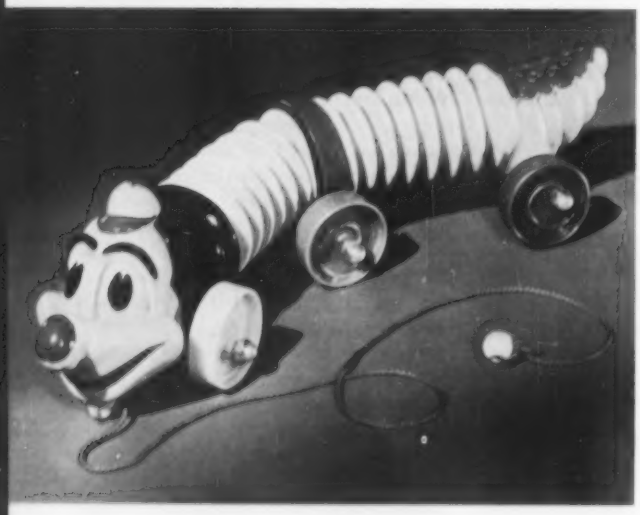


MINE OPERATIONS. Since vinyl-covered belt does not support combustion, it is finding increasing application in conveying coal in mine pits

Photos on this spread courtesy Scandinavia Belting Co.

PLASTICS

Rock-and-Roll Pull Toy



A comic caricature caterpillar pull toy, incorporating parts of vinyl and polystyrene, is designed to squeak whenever its long flexible body is squeezed. The vinyl body is produced in two sections in a 48-cavity mold by rotational casting. Wheels and center body sections are injection molded of styrene. When the two center body sections are cemented together, the two halves of the vinyl body are locked securely in-between.

Called Krazy Krawler, the toy will hump its back, ripple and rock when pulled along a level surface. Three sets of styrene wheels are mounted off-center from the axle on each side of the vinyl body to create this animated action when the toy is in motion. The wheels are joined to wooden axles and the hubs are covered with metal caps. Attached to the pull toy's goatee-like chin is a 32-in. rayon cord with a wooden ball on the end.

CREDITS: Manufactured by Kusan, Inc., 2716 Franklin Rd., Nashville, Tenn. Vinyl by Flexible Products Co., Marietta, Ga. Styrene by The Dow Chemical Co., Midland, Mich.

Multi-Purpose Utility Pail

Molded polyethylene pails that will not scratch or mar tile, porcelain, or polished surfaces are the latest plastic products developed especially to ease the housewife's lot. Rustproof and dentproof, the lightweight pail has a capacity of 10 qt., and, being resilient, will not clatter or clang when banged against floor or furniture. It is easy to clean and can be used for a variety of household jobs, serving equally as well as a garbage pail or scrub bucket. With the addition of a cover, the pail can be converted into a diaper hamper or an ice tub.

A reinforcing rim molded around the top periphery of the pail lends extra rigidity for carrying heavy loads. The handle assembly consists of a metal bail with a molded styrene handle. The bail is inserted through thick molded-in lugs on the rim of the pail and crimp-locked in place.

The multi-purpose pail is 10½ in. in diameter and 19½ in. high. It is produced in a 48-oz. injection machine in a single-cavity mold.

CREDITS: Manufactured by Columbus Plastic Products, Inc., 1625 W. Mound St., Columbus 4, Ohio. Polyethylene supplied by Eastman Chemical Products, Inc., Kingsport, Tenn.

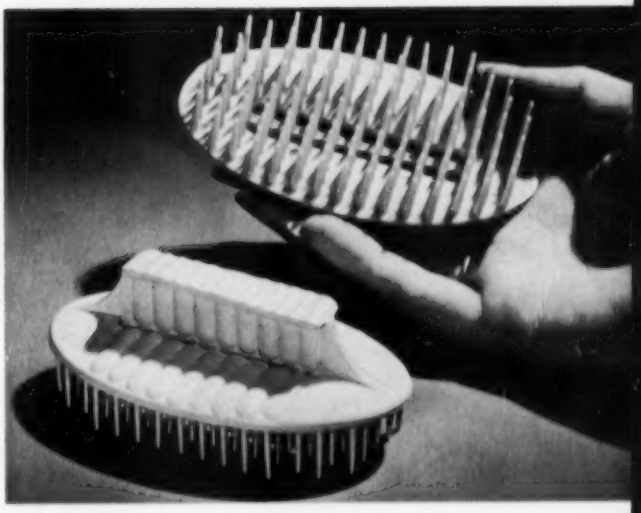
PRODUCTS

One-Piece Floating Shampoo Brush

A polyethylene shampoo brush called Glamorbrush is molded in one piece, including the pliant bristles which are responsible for the effectiveness of the brush. Unlike conventional shampoo brushes, the one-piece construction of the polyethylene brush means that bristles cannot become soggy or fall out, and that the flexible brush will not become deformed with use. Glamorbrush, which is light enough to float, has a non-slip handle and can be used for brushing, shampooing, rinsing, and daily scalp massaging. The brush fits comfortably in the palm of the hand and can be kept clean by flushing with hot water. It is available in a range of pastel colors.

Glamorbrush is produced complete on a 32-oz. injection molding machine in a single-cavity extended nozzle mold designed for automatic operation. The molding cycle is 25 seconds.

CREDITS: Manufactured by Thomas Mfg. Corp., 80 Clinton St., Newark 5, N. J. Polyethylene supplied by Eastman Chemical Products, Inc., Kingsport, Tenn.

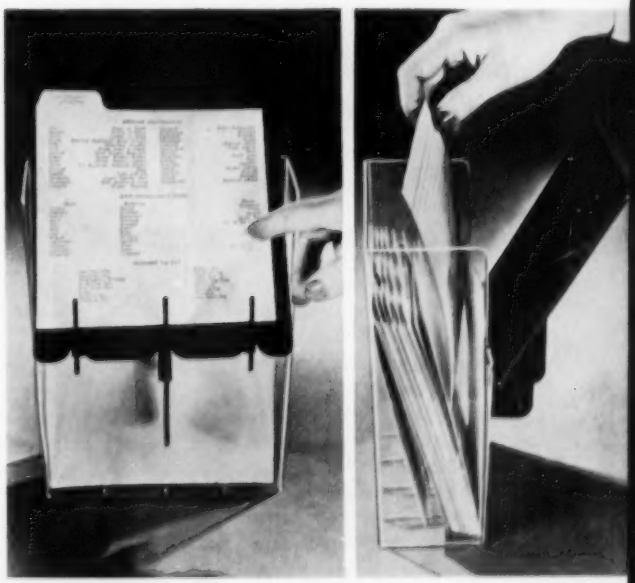


Transparent File Case With Easel

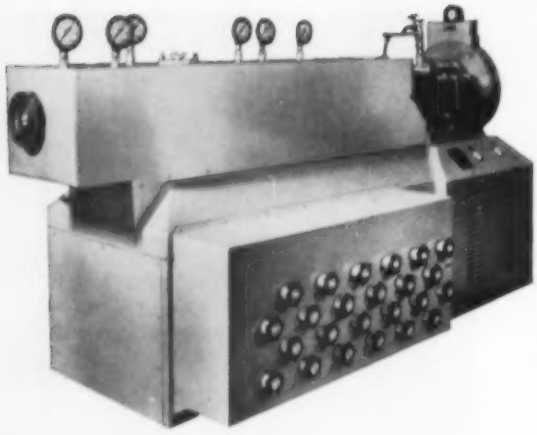
A clear and easy-to-clean styrene file card case with a handy reading easel keeps recipes, coupons, budget lists, etc. on file ready for instant use. Filed items can be removed from the case and placed on the tilted easel for quick and easy reading without being smudged or soiled by the necessity for frequent handling or turning. The easel is attached to the case by hinges which fit snugly into slots molded into the face of the card case. The hinged construction makes it easy to flip up the easel to select a specific recipe or file card. Tabbed yellow index cards arranged in alphabetical order make filing and finding a simple matter. The case is 6$\frac{5}{16}$ in. wide, 8 in. high and will hold about 200 file cards. Water, strong alkalies, soaps, foods, and detergents can be easily wiped off the styrene case without leaving stains.

The file case is produced on a 32-oz. injection molding machine using a single-cavity mold. The easel and its three fins are molded in a two-cavity mold in a 12-oz. machine.

CREDITS: Manufactured by Flexi-Bin Corp., 6607 Olive St. Rd., St. Louis County 5, Mo. Styrene supplied by Bakelite Co., New York, N. Y.



WELDING ENGINEERS DUAL-WORM COMPOUNDER-EXTRACTOR-EXTRUDERS "NEVER REST ON THEIR LAURELS"

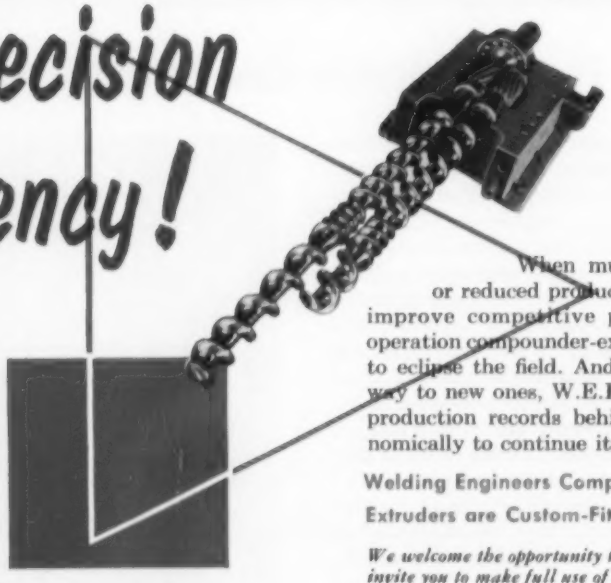


There is no room for tarnished thinking or static engineering in the Welding Engineers organization. Because superior compounder-extractor-extruders are the heart of many successful plastic processes, the demands on W.E.I. dual-worm "flexibility" increase with the development of new hard-to-handle materials and the limitless production goals by the giants in this fast-moving, progressive industry.

In the development of the vast majority of new processes, W.E.I. equipment plays an important part because of the flexibility of treatment possible with custom-fitted dual-worm flight combinations.

When more complex mixing in the material poses a new problem—W.E.I. engineers and equipment solve it. When "impossible" adhesive characteristics must be overcome or more difficult volatile extraction must be performed—Welding Engineers Inc. tackles the job and adds new laurels to the reputation of W.E.I. machines.

Custom-fitted for Precision Efficiency!



When multiplied production goals or reduced production costs are essential to improve competitive positions—W.E.I.'s one-operation compounder-extractor-extruders are built to eclipse the field. And, when old processes give way to new ones, W.E.I. equipment with years of production records behind it . . . is modified economically to continue its efficient production.

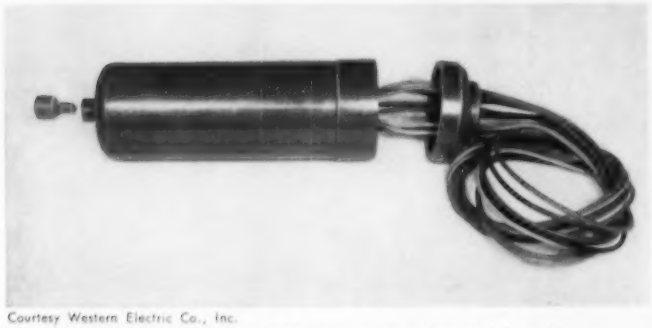
Welding Engineers Compounder-Extractor-Extruders are Custom-Fitted to Precision Efficiency

We welcome the opportunity to work with your engineers and invite you to make full use of our laboratory facilities to solve your particular plastics processing problems. Remember, the unique W.E.I. dual-worm design makes the difference. Remember, every W.E.I. compounder-extractor-extruder is custom-fitted to precision efficiency—your best investment for the present . . . and for the future.

Welding Engineers, Inc.

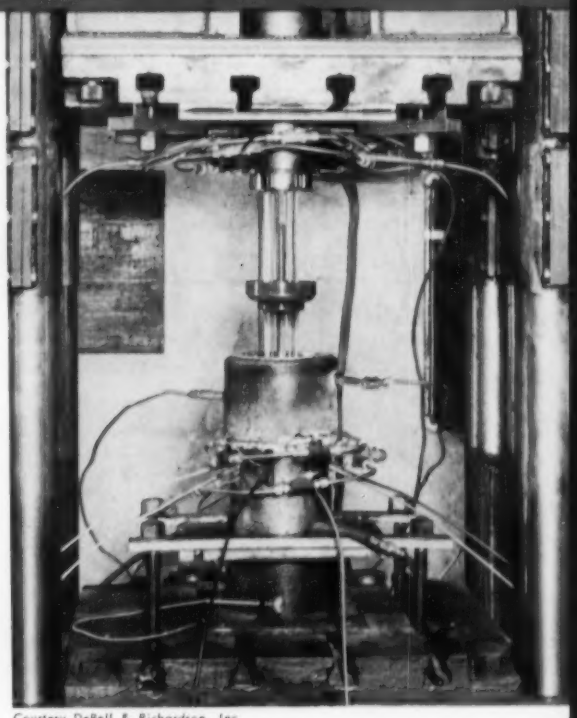
NORRISTOWN
PENNSYLVANIA

MANUFACTURERS OF IMPROVED MACHINERY FOR THE PLASTICS, RUBBER, CHEMICAL AND PETROLEUM INDUSTRIES



Courtesy Western Electric Co., Inc.

Parts of housing for electrical unit (l. to r.: sealing plug, bottle, and cap) are transfer molded of butyl-modified polyethylene



Male and female halves of cap mold have holes to accommodate polyethylene-insulated wires that run through and are fused to cap

Courtesy DeBell & Richardson, Inc.

Problems encountered in producing electrical unit for underwater use are solved by application of new techniques for

Molding and Welding Polyethylene

by H. R. BOSWORTH†

AN INTERESTING combination of mold design, molding techniques, and plastic welding procedures is being used in producing a recently developed electrical unit for continued underwater use. The unit is sealed in a flexible polyethylene housing within which a relatively incompressible fluid balances the external water pressure.

The housing consists of three molded parts—a cap, or cover, which has eight polyethylene-insulated wires molded through it, with the insulation of each wire fused to the cap during molding; a bottle; and a sealing plug. All parts are made of a polyethylene compound containing 5% of butyl rubber which improves resistance to corrosion cracking but also introduces new molding and welding problems.

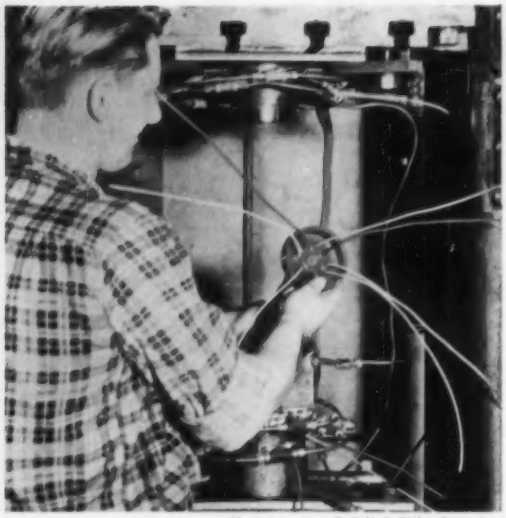
The cap and bottle are joined together by a welding operation similar to that used in making gas welds in steel. The plug is also sealed to the end of the bottle in like manner. The complete unit—bottle, cap, and plug—is about 13 in. long (not including the lead wires which extend 3 ft. beyond the cap), and 4 in. in diameter, with ¼-in. wall thickness.

Because of the butyl rubber in the compound, it was found impossible to injection mold the parts satisfactorily. Accordingly, it was necessary to mold them in a Bolling transfer press. The material is preplasticized in a 1½-in. extruder, the extruder being run at intervals for the length of time necessary to deliver a charge of the correct weight. This charge of hot material is immediately placed in the pot and transferred into a hot mold. The heat is held in the mold until complete fusion is obtained and the stresses are relieved, after which it is cooled with circulating water.

The cap mold is special in that the

* Reg. U. S. Pat. Off.

† Manufacturing Engineering, Radio Div., Western Electric Co., Inc., Winston-Salem, N. C.



Photos courtesy DeBell & Richardson, Inc.

Wires are fused to cap at points where they enter to assure water-tightness of the completed housing

Operator removes bottle part of housing from transfer press. Mold is cycled to allow stress relief

polyethylene-insulated lead wires must be threaded through the mold and come out both top and bottom. When the mold is heated, the polyethylene-covered wires must be kept cool with individual cooling coils so that the coating will not melt and be forced out or distorted by the molding material under pressure; at the same time, the cooling must be limited so that the wire insulation will bond to the molded cap at the mold face. The mold is cycled for about 8 min. under steam pressure of 20 p.s.i., after which the steam is turned off and cooling water is circulated in mold for 5 minutes.

The bottle is molded in much the same manner except that there is no problem with wires. The mold is cycled, however, to relieve strains and make the part dimensionally stable; the mixture of polyethylene with butyl rubber is quite nervy, and it is not unusual to have poorly molded parts shrink ¼ in. in length if the strains are not relieved. The cycle is similar to that of the cap mold.

In joining polyethylene parts by welding, accepted practice is to bevel the edges of the parts to be joined so that a V-notch is formed when the two edges are placed together. The notch is then filled, using a polyethylene welding rod and applying heat so that the surfaces become plastic enough to flow together into a welded seam. The heat is applied by means of an electrically heated torch with a small nozzle so that a hot gas jet can be directed upon the surfaces to be joined together. Nitrogen, directed through the torch, prevents oxidation; oxidized surfaces cannot be satisfactorily welded. Because of the addition of butyl rubber to the polyethylene, in this case, it is necessary to use more care in order to produce an acceptable weld than when polyethylene is used alone.

Welding Procedures

The first operation consists of connecting the inner ends of the leads, projecting through the cap, to the inner electrical unit. Then the bottle is slipped over the opposite end until it is in contact with the lip of the cap. The unit is then clamped into a special lathe fixture so that it can be rotated at approximately 600 r.p.m. with a turning tool applied at the junction of the parts to cut a 60° V-groove. This operation exposes clean unoxidized surfaces and provides a suitable groove into which the welding rod may be laid.

A short length of $\frac{3}{16}$-in. diameter extruded polyethylene-butyl rubber rod is cleaned with sandpaper and the starting end tapered with a sharp knife. Direction of rotation of the lathe is reversed, and the speed of rotation is greatly reduced. With the lathe stationary, the tapered end of the welding rod is held near the bottom of the V-groove and the sides of the V-cut and the welding rod are heated by directing the jet of hot nitrogen gas against the surfaces. When the surface of the parts begins to soften, the rod is pressed into the bottom of the groove with a rolling motion in the direction of the operator, and at the same time the torch is also moved in the same direction. Power is applied by means of a foot switch to cause the parts to rotate as required by the operator.

Temperature of the welding gas stream is adjusted to about 475° F. by means of a variable auto transformer with the gas pressure set at about 20 to 50 p.s.i., these values having been determined by previous experimentation.

To insure dependability of the joint, a second weld is laid on top of the first one. In this case, the welding "rod" is an extruded strip 3/16 in. thick by 3/4 in. wide. Again, a groove is cut in the material approximately 3/4 in. wide and deep enough to cut away about one half of the weld previously formed. Welding is done in the same manner as previously described except that the hot gas jet is swung from side to side in order to heat all surfaces that are to be welded to approximately the same temperature.

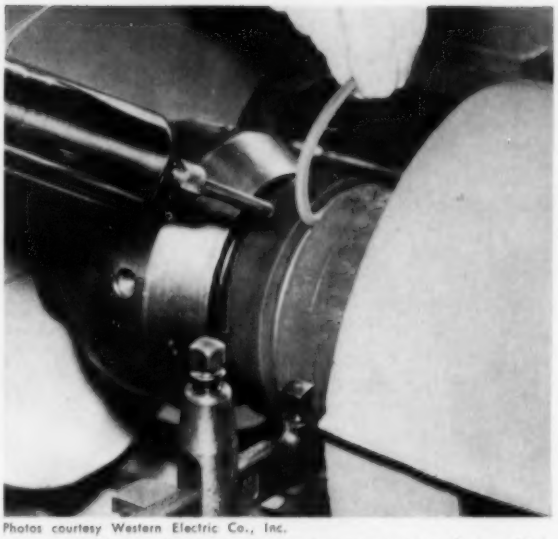
After completion of the welding operation, the excess material is removed by a special cutting tool with the assembly still in the lathe. This reduces the weld diameter to match the bottle diameter.

Checking for Leaks

The weld is then checked for leaks in a helium leak detector by placing the small opening in the end of the bottle over a fitting in the detector. A cylindrical cover is placed over the unit and the bottle is evacuated to an absolute pressure of 11 microns. Helium is then introduced into the cylindrical cover so that a helium atmosphere surrounds the bottle. Any leaks are indicated by the detector. The weld is not considered acceptable if the indicated rate of leakage is in excess of 0.38 c.c. per year.

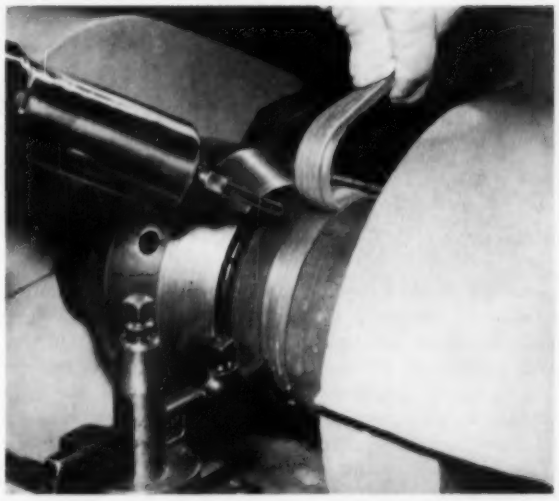
The bottle is then completely filled with a special mineral oil. After filling, the plug is inserted into the small opening and welded to the bottle, using two welds in the same manner as previously described. Adequacy of this weld is tested by placing the assembly in an air-operated fixture, so constructed that a thrust of 300 lb. is applied to the end of the bottle, and observing any indications of oil leaks. The most minute leaks are readily detected under ultra-violet light because the oil used in the unit becomes fluorescent when exposed to radiation from that part of the spectrum.

CREDITS: Molder—DeBell & Richardson, Inc., Hazardville, Conn.; development—Robert Kent, Bell Telephone Laboratories.



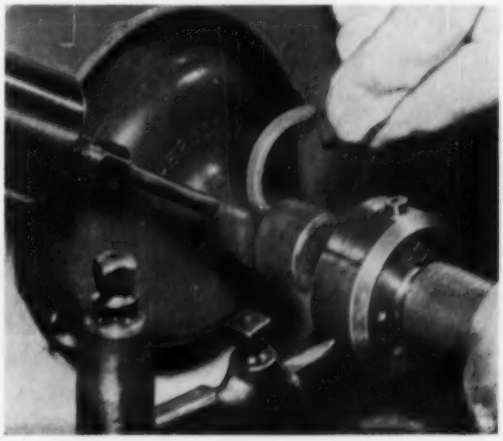
Photos courtesy Western Electric Co., Inc.

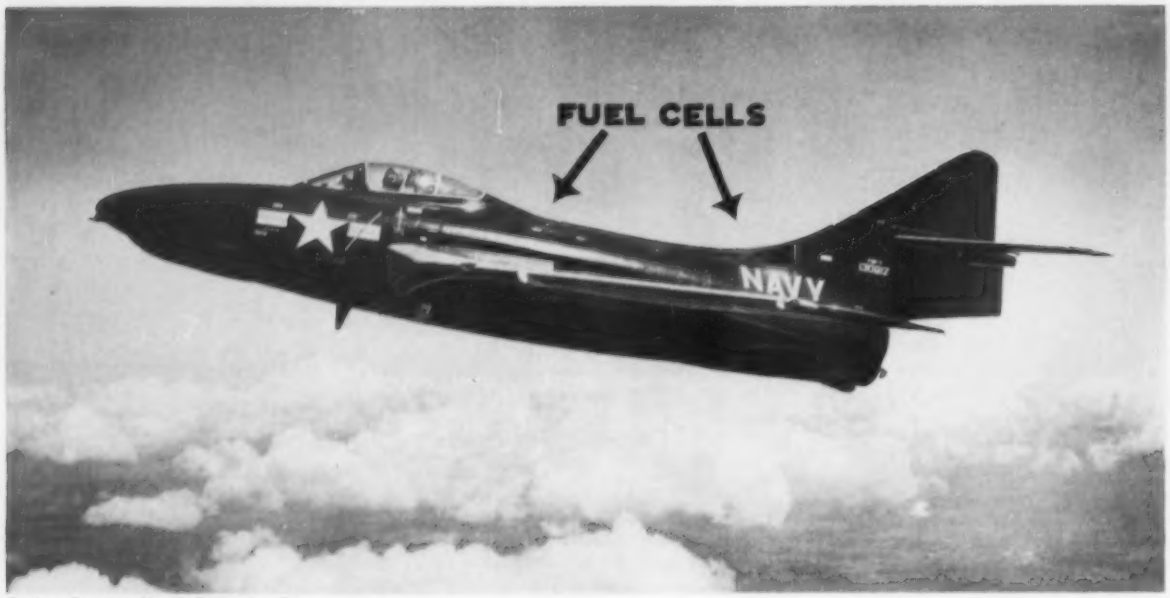
Using polyethylene-butyl rod of circular cross-section, first weld is laid in V-shaped groove cut at junction of bottle and cap lip



Second weld is laid on top of first, using flat strip of butyl-polyethylene as welding rod. Bottle and cap are held in special fixture

Plug is welded to bottle. After all welding operations have been completed, housing will be carefully checked for leaks





Courtesy Grumman Aircraft Engineering Corp.

Reinforced plastics compartment liners safeguard fuel cells of F9F-8 Cougar jet plane

Protection for Jet Plane Fuel Cells

Bag molded reinforced plastics compartment liners protect fuel containers from chafing against fuselage ribs, increase planes' fuel capacity

PACKING in as much fuel as possible is obviously of the utmost importance to jet fighter planes—and reinforced plastics have been put to use in the Grumman F9F-8 Cougar to increase over-all fuel capacity. Fuel is carried in these planes in self-sealing rubber fuel cells. These cells were formerly slung in canvas hammocks, but the recent development and production use of reinforced plastics liners for the fuel cell compartments has permitted the use of cells having a capacity considerably greater than previously possible.

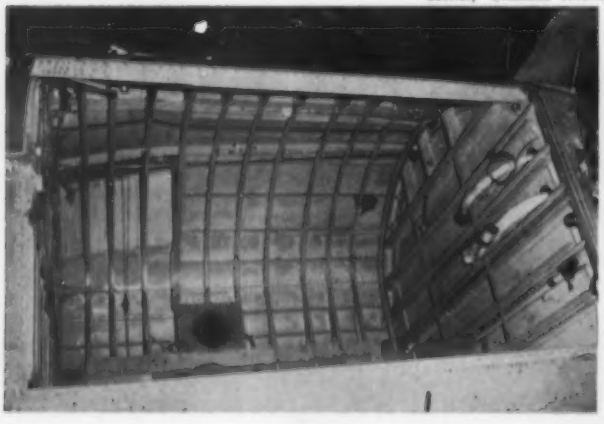
Function of the compartment liner is to protect the rubber cell from chafing against the structural members on the interior of the fuselage. Without this protection, the life of the cells would be brief indeed; in addition, there would be the very apparent danger of a fuel cell rupture while in flight.

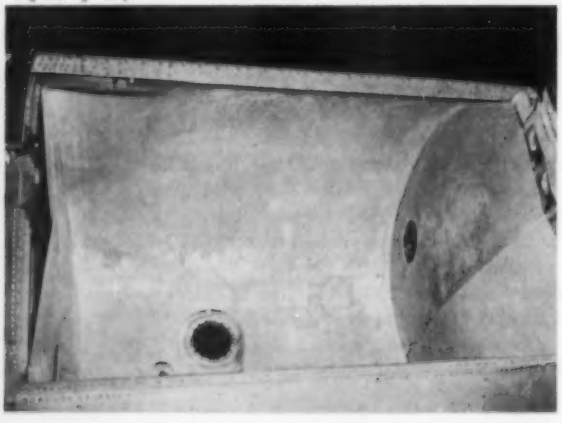
The reinforced plastics lining for one cell consists of two parts for

Fig. 1—View of unlined interior of one of the two compartments that are used on the F9F-8 Cougar to carry its self-sealing fuel cells

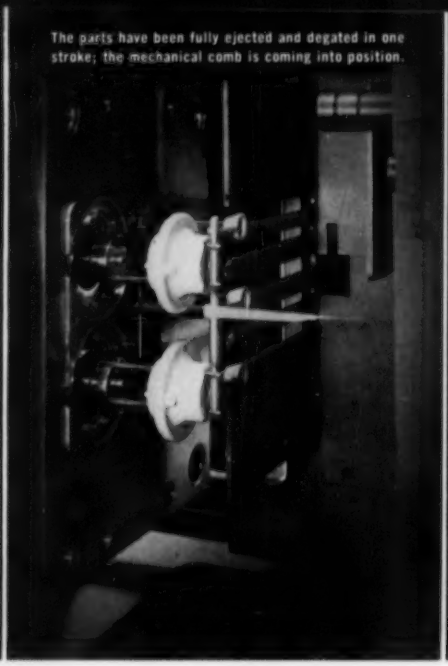
Fig. 2—Same compartment with side and bottom parts of liner in place. Points of assembly are at frame and around access ports

Courtesy Grumman Aircraft Engineering Corp.





The press is fully open, showing a 5-cavity mold used to produce two different parts from an assembly.



The parts have been fully ejected and degated in one stroke; the mechanical comb is coming into position.

The pins retracted, finished parts read. to be packaged, sprue and runner fall into the discharge chute.

THIS IS COST-CUTTING AT WORK...

STOKES truly automatic injection molding machine cuts costs for plastic molders

Truly automatic injection molding is helping molders to operate more profitably. The unique Stokes features of *automatic degating* and *positive ejection* produce finished parts, ready for packaging and shipment without further processing. They provide a degree of automatic operation unequalled in the field today.

The Stokes 4-ounce injection molding machine ends compromise between mold cost and labor charges. Mold cost can be kept low, fewer cavities used, cost per piece kept to a minimum because of low labor charges. For custom molders, the Stokes Model 700 provides the flexibility required in this competitive field.

The new Stokes machine is universally automatic . . . each type of part can be run with equal efficiency and economy. You should know more about the Stokes Truly Automatic Injection Molding Machine. Write for Bulletin 560 which contains full information. Ask also for an informative brochure, "Fully Automatic Molding".

F. J. Stokes Machine Company
Philadelphia 20, Pa.

This plastic part, used as a connector between wet mop and handle, could only have been made economically on a Stokes *truly* automatic injection molding machine.

Produced in small quantity by a custom molder, the part had to be competitive in price with the metal stamping it replaced. On a semi-automatic machine, labor cost per piece would be excessive because the small mold would limit production. If a large mold were used, mold cost per piece would be excessive because of the short run. On the Stokes 4-ounce injection molding machine, an inexpensive 4-cavity mold was used and automatic operation reduced labor cost per piece to a point at which the molder could secure the contract.

STOKES

Photos courtesy Orowac, Inc.

Fig. 3—Coating of P.V.A. parting agent is dried under battery of infra-red lamps after being sprayed on cast phenolic mold

Fig. 4—Lengths of polyvinyl alcohol film are electronically heat-sealed until width required for making molding bag is reached

Fig. 5—Mold, with P.V.A. bag in place over resin-impregnated layers of glass cloth, and vacuum drawn, is rolled into oven for cure

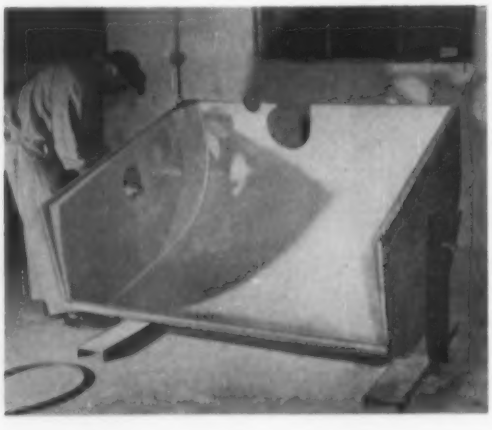


Fig. 6—Openings in compartment liner are sawed and routed on jig after removal of part from the mold

the bottom, ends, and sides, and one part for the top. Figure 1 shows the unlined interior of a fuel cell compartment, while Fig. 2 shows the same compartment with two liner halves in position. The top side edges of the liners are clipped onto the aluminum frame and the only other points of assembly are at the access ports. The edges of the liner are butted but not permanently attached to each other. This type of construction is possible since the rubber fuel cell, when in position, presses all parts of the liner against the fuselage ribs.

The liners are very thin, being made of only two layers of fibrous glass cloth, excepting those sections adjacent to the access ports which are beefed up with several additional layers. The parts are bag molded on a cast phenolic male mold.

P.V.A. Parting Agent

Before lay-up, the mold is sprayed with a solution of P.V.A. which is subsequently dried by infra-red lamps (Fig. 3). This coating serves as an excellent parting agent. It is also economical, because the bag used in molding is P.V.A. film and the scrap can be used to make the parting agent solution by simply dissolving the scrap in water. Another point of economy, since the bags can only be used once, is that they can be easily fabricated in a molder's

Syringes molded for Delta Laboratories, Inglewood, California, by Artcraft Plastic Moulders, Ltd., Los Angeles, California.

Syringes made of **TENITE POLYETHYLENE** are non-reactive, non-toxic and inexpensive enough to throw away after one use

These veterinary syringes made of Tenite Polyethylene are a new idea. They are both container and dispenser for drugs.

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Ideas like this are expanding the use of versatile Polyethylene. Today, applications include packaging film, molded products, wire and cable insulation, pipe and tubing, paper coatings and unbreakable containers of all types.

Does Tenite Polyethylene give you ideas? Perhaps you have a product that could be given more sales appeal, better performance or longer life if made of Polyethylene. If so, make it of *Tenite* Polyethylene.

There are many advantages to specifying Tenite Polyethylene. This Eastman plastic comes in the form of spherical pellets that flow freely through molding and extrusion machine hoppers. Their smooth surfaces resist dirt and, because there are fewer "fines," molders can clean hoppers quickly when changing colors. In addition, you get outstanding color quality, homogeneous color dispersion and a finish that approaches the smooth, lustrous surfaces obtained with plastics of much greater inherent hardness.

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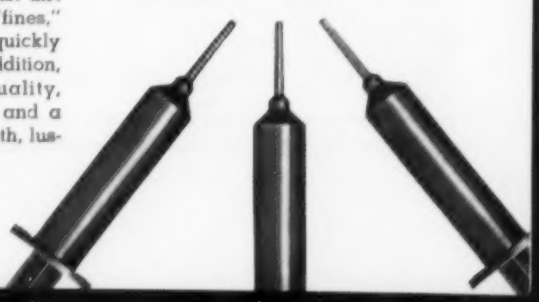


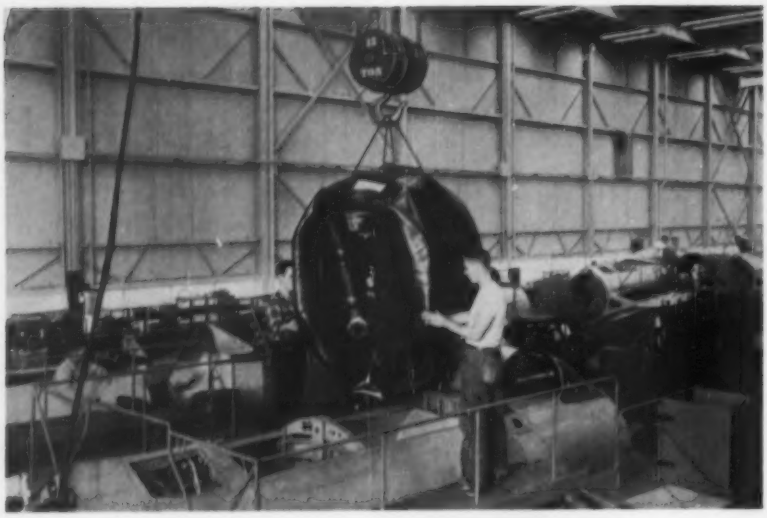


Fig. 7—Self-sealing rubber fuel cell is lowered into forward fuel cell compartment, with sides and bottom parts of the molded reinforced plastics liner in place

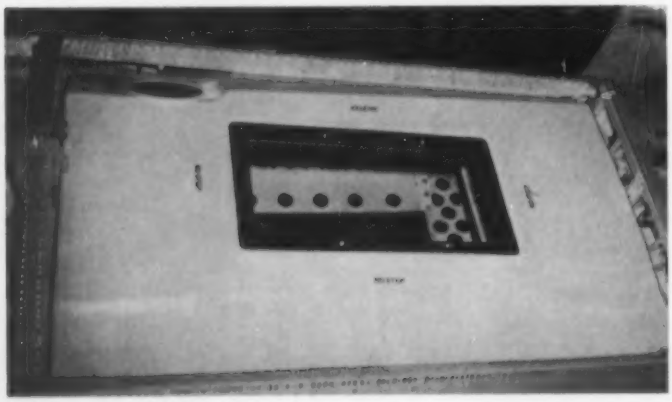
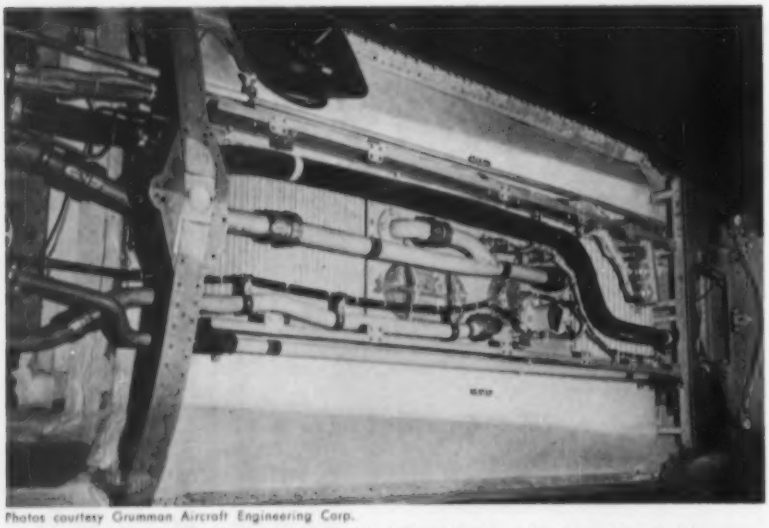


Fig. 8—Reinforced plastics fuel cell cover is secured to edges of fuel compartment framework and to metal frame molded integrally with top opening of rubber cell



Photos courtesy Grumman Aircraft Engineering Corp.

Fig. 9—View of completed fuel cell assembly, before fuselage skin is positioned. All wiring for engine and tail controls and all fuel tubing and piping is in place

plant from a roll of P.V.A. film. A simple electronic heat-sealer is used to bond lengths of film to get the needed width (Fig. 4).

After the parting agent has thoroughly dried, tailored layers of polyester impregnated glass cloth are laid smoothly on the mold. Additional strengthening layers for the access ports are die-cut and accurately positioned on the lay-up, after which the entire lay-up is covered with the bag of P.V.A. film. The edges of the film are draped over the mold base and an angle iron frame, adequately gasketed, is clamped tightly to make a seal between the mold base and the P.V.A. film. A vacuum is then drawn between the mold and bag, causing atmospheric pressure to force the lay-up against the mold. As the vacuum is being drawn, excess air trapped at points under the bag is ironed out, so that when the job is finished the bag lays smoothly against the entire surface of the lay-up. The mold is then rolled into a heated oven (Fig. 5) for cure.

After the part has been removed from the mold and the P.V.A. bag stripped off, flash is sawed off and the various openings are sawed and routed in a jig (Fig. 6). All three of the reinforced plastics parts for each cell compartment liner are molded and finished similarly.

After the two parts forming the sides and bottom of a liner are assembled in a fuel cell compartment, a rubber fuel cell is lowered into position (Fig. 7). A rib structure is then assembled inside the fuel cell to support the flexible walls and a set of baffles is installed. The reinforced plastics cover is next secured, both to the edges of the fuel compartment framework and to a rectangular metal frame molded integrally with the top opening of the rubber cell (Fig. 8).

Figure 9 shows the finished job before the fuselage skin is installed. The wires are for engine and tail controls; the piping conveys the fuel. The photos used to illustrate this article all show the front cell; however, molding and assembly operations are exactly the same for a second cell located near the tail.

CREDITS: Polyester resin—Koppers Co., Inc., Pittsburgh, Pa.; cast phenolic mold material—Rezolin, Inc., Los Angeles, Calif.; molder—Orowac, Inc., Bayshore, N. Y.; P.V.A.—J. P. Schwebel & Co., Inc., New York, N. Y.

Making Inflatables Continuously

Printed layer of non-adhesive material permits production of heat-sealed seams on continuous welding machines

by WALTER DONGES*

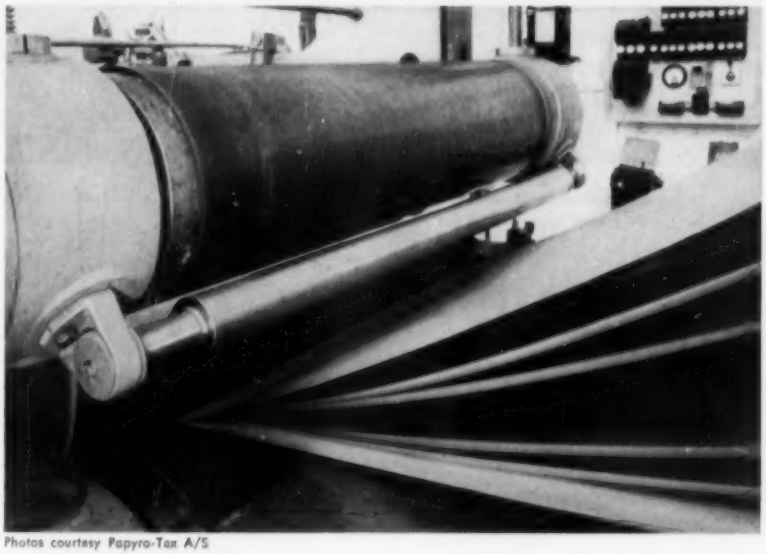
INFLATABLE mattresses, containers of different kinds, bathing toys, boats, children's swimming pools, etc., are normally made by high-frequency welding of seams in coated fabric or unsupported thermoplastic sheeting. The manufacture of large inflatable items by this process has one disadvantage in that the tools are somewhat expensive and, furthermore, that they can be made only in limited sizes. For large sizes several forms of welding electrodes are a must: arcs, sharp bends, etc.

In order to avoid pin-hole leakage in the finished product, it is preferable to use two layers of sheeting on each side of the air chamber. The laminating of the two layers of sheeting is ordinarily carried out in a separate process prior to welding the seams.

For some years our firm has

(*To page* 253)

*Papyro-Tex A/S, Herlev, Denmark

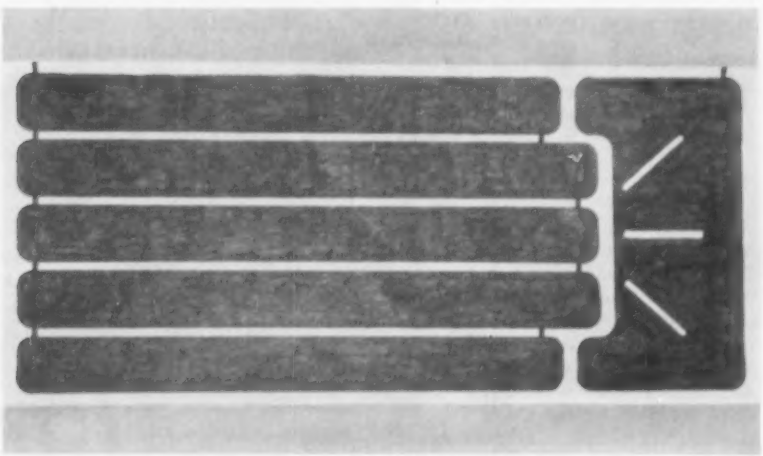


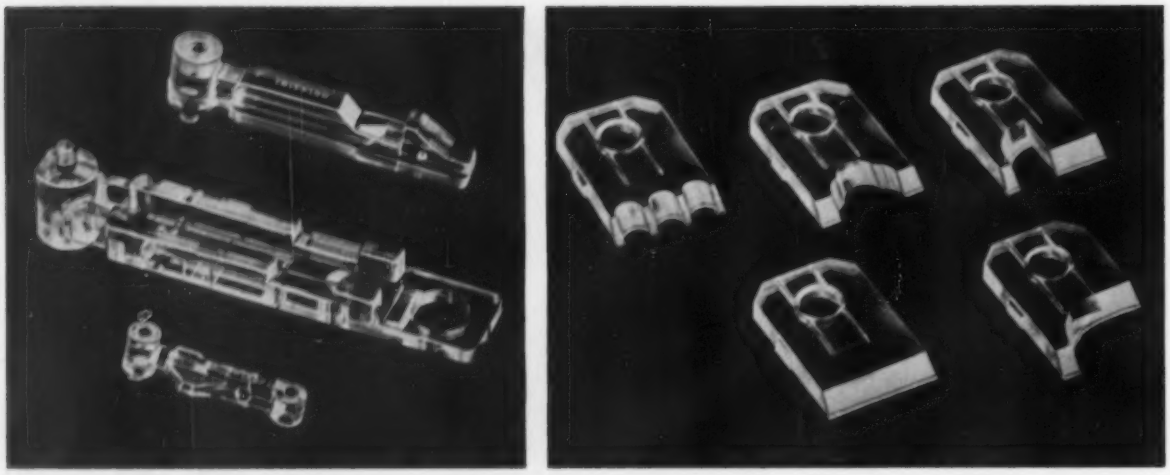
Photos courtesy Papyro-Tex A/S

Six layers of sheeting, to be made into inflatable, are being fed into continuous welding machine: top and bottom layers of coated fabric and four layers of vinyl in between. Third sheet from top has part of its surface made non-adhesive by printing process

Inflatable mattress is economically heat-sealed by continuous welding process involving use of vinyl sheet with surface selectively treated for non-adherence

Dark areas on vinyl sheet have been silk-screened with polyamid solution to make them non-adhesive. Heat-sealing of seams takes place along light-colored portions only





In investment casting technique, styrene patterns are used (left) to produce molds in which machine gun trigger mechanism components and (right) cutter blades are cast. Finished parts have smooth surfaces and require a minimum of secondary machining operations

STYRENE PATTERNS for Investment Casting

Close-tolerance injection molded pieces, which leave a minimum of residue when melted out of molds, give new economy to foundry process

by RICHARD A. PERELES

INJECTION molded styrene pieces have been proved to be ideal for use as patterns in investment casting and have given new impetus to this fast growing segment of the metal industry. Investment casting, long known as the "lost-wax" or "precision-casting" process, consists, briefly, of making use of a relatively low-melting-point pattern, around which is formed a bonded sand or ceramic mold. When this mold or "investment" has hardened, heat is applied to melt out the pattern and leave a precisely contoured cavity in which molten metal can be cast to form parts that exhibit extremely close tolerances and are characterized by smooth surfaces.

The Method

Obviously, the key to the success of investment casting lies in the patterns. Injection molded polystyrenes lend themselves to mechanized production of identical pieces and styrene patterns now lead the field because the low cost of producing the styrene patterns in large quantities makes possible enormous monetary savings which have opened an entirely new market potential for the metal casting process. In addition, styrene leaves a minimum of residue when the pattern is melted out of the investment.

Investment casting involves the following procedures:

1) Patterns are gated and assembled on a sprue to form a "tree."

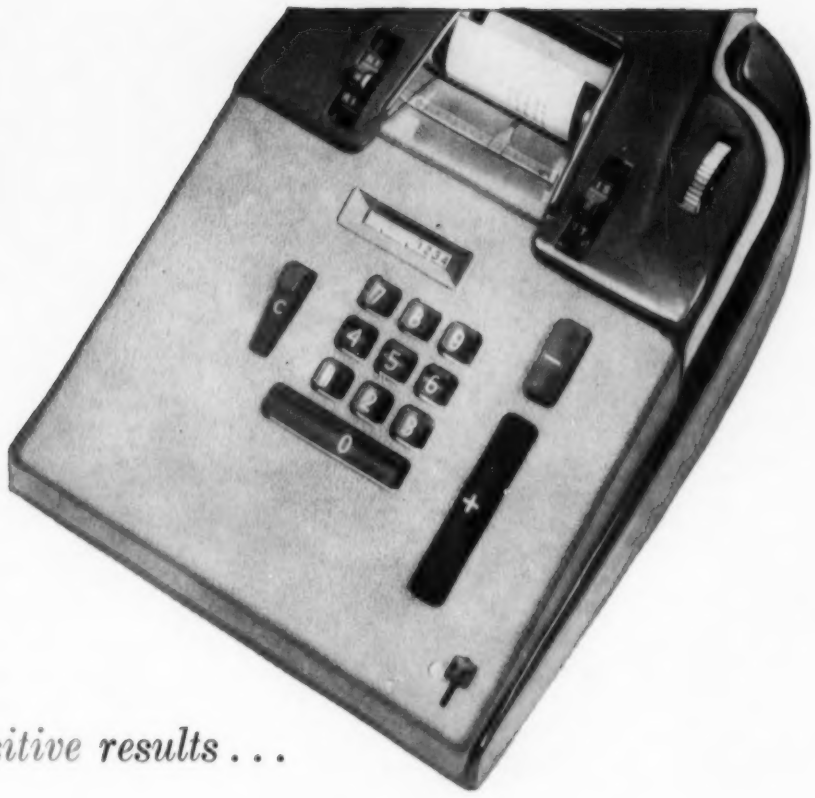
2) The tree is placed in a container called a "flask" and a refractory material plus a binder poured around it to form the investment. When the investment is heated to disintegrate the patterns and the gating system, an exact replica of them remains impressed in the cavity in the refractory material. In such cavities can be cast most metals —ferrous or non-ferrous—and with this process it is possible to manufacture parts of materials so hard that they could not be produced by machining. Even the newer metals that melt in the 3000° F. range can be satisfactorily cast by this process.

The cycle is completed with the breaking out of the metal tree, removal of the gates, and cleaning

(*To page* 133)

THE AUTHOR

Richard A. Pereles was educated at the University of Michigan where he received his degree in Mechanical and Industrial Engineering. He now also holds a Masters in Business Administration. While at the University, Mr. Pereles engaged in extensive research in the investment casting field. Mr. Pereles' background also includes many summers at Pereles Brothers, Inc., precision custom molders and, following graduation, entrance in their intensive training program. He is now assistant director of research as well as development engineer for the above firm.



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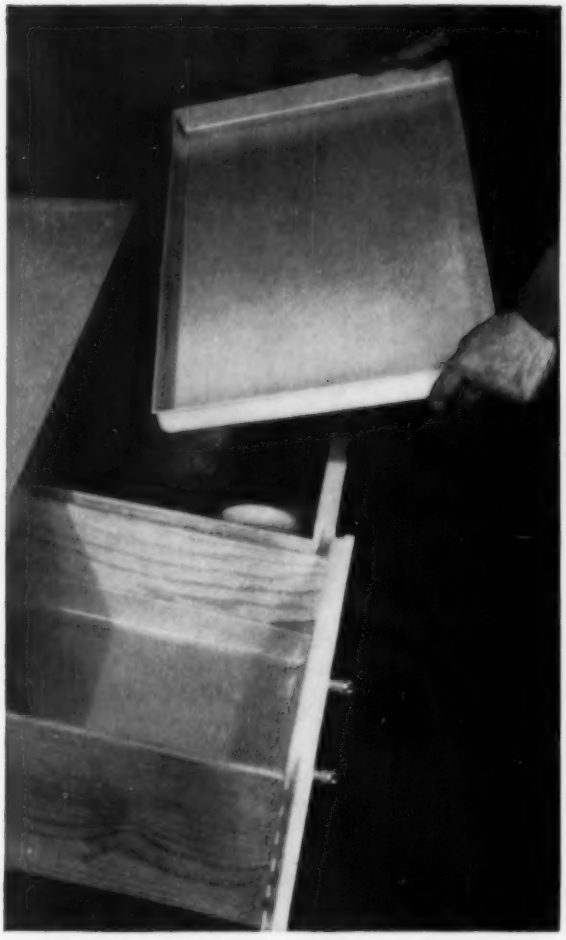

Drawer liners for **Sears, Roebuck and Co.** "Caravan" furniture are produced by *Panelyte Division,* **St. Regis Paper Co.,** Chicago 41, Ill.

Vacuum-formed impact styrene trays... big selling point at low cost

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These sales advantages are inexpensive, too, because vacuum-forming is a fast, economical production method. And BAKELITE High-Impact Styrene TGD-5001 was developed especially for vacuum-forming. Since sheets of TGD-5001 are still glossy after forming, no extra finishing operations are needed. TGD-5001 offers a range of attractive colors, and demonstrates excellent toughness in service.

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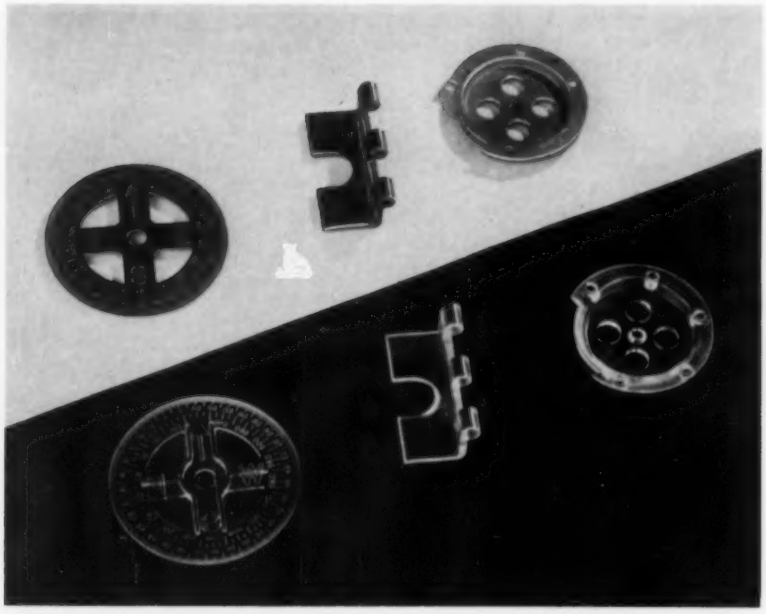


Compass dial, angle hinge, and cover for sewing machine bobbin (top) were cast to close tolerances in investments made from injection molded styrene patterns (below)

of the castings. Where numerous secondary machining operations would be required on castings produced by other methods, savings of up to 50% can be expected with investment casting.

Molder-Caster Team

Teamwork between the styrene injection molder and the investment caster can produce a metal product with closer tolerances than can be had by any other foundry process. It follows that a molder who specializes in precision plastic patterns becomes an equal partner with the caster in engineering a fundamentally superior metal product.

The molder, of course, is primarily interested in the construction and operation of a metal mold capable of producing plastic patterns to the required tolerance and design features, while the caster is mainly concerned with investment technique, alloy control, and surface finish.

Problems to be Faced

Many of these problems overlap; they can be summarized as follows:

1) *Plastic pattern tooling cost.* This is directly proportional to the size of the casting, its intricacy, wall thickness, parts quantity, and the tolerance to be maintained.

a) Tolerances closer than functionally necessary require unnecessary molding controls, resulting in a higher end product unit cost.

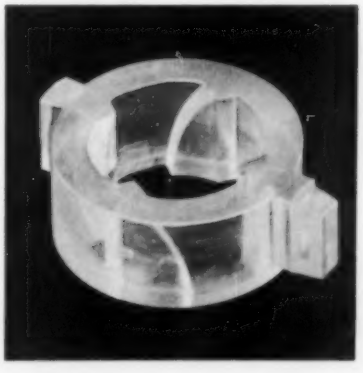
b) Size of casting is often a limiting factor in the construction of multi-cavity molds.

c) Wall thicknesses in excess of functional needs reduces output, again resulting in higher unit cost.

d) Quantity required often determines the number of duplicate cavities to be constructed. In this instance, a balance must be maintained between a higher tooling cost and a lower piece price or its reverse.

2) *Filleting as opposed to sharp angled corners.*

Styrene pattern with complicated contours for pinion gear investment



a) Filleting should be accomplished wherever possible because, under load, product strength is increased by relieving local stress.

b) Filleting results in a cheaper product because casting fill-out is more positively assured.

3) *Blind holes.*

a) Blind holes whose depth exceeds twice the diameter should be avoided because such unsupported cores of investment have a tendency to break off during casting.

b) Blind holes should also be avoided to eliminate expensive removal of investment material.

4) *Section thicknesses.*

a) Excessive differences in section thickness should be avoided wherever possible because, like the injection molder, the caster will have difficulty in developing suitable gating systems.

b) Excessive differences in section thicknesses could result in incomplete heavy section metal fill and harmful shrinkage. This would be due to premature solidifying and freezing of the thinner sections.

5) *Internal and external threads and undercuts* can be included in the plastic pattern. Substantial product savings, however, can often be effected through handling this as a secondary operation.

6) *Gating systems* necessary for the production of sound metal parts are often contrary to good injection molding practice. Skillful die design can often solve this problem.

7) *Surface finish.* It is often impractical to alter a casting's surface finish as, for example, in the case of the face of a numbered dial. To avoid secondary machining operations, unusually close control of both plastic pattern and metal casting must be achieved. Here there is no substitute for experience, tool making skill, and mutually developed operating technique.

8) *Draft.* Proper plastic pattern design together with good casting procedure reduces draft considerations to a minimum.

Design for Method

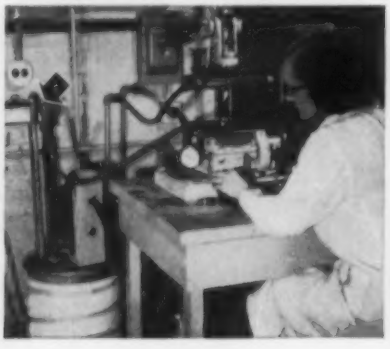
All of this adds up to the fact that the molder and the caster must jointly consider all part design problems. The plastics engineer and the caster must also educate the customer to design specifically for investment casting because this proc-

(*To page* 136)

PLATENS . . . Injection molding machine has platens heated by water which is circulated at a temperature of 180°F from tank equipped with a 2500 W Chromalox immersion heater. There are 18 machines on this production line operating 24 hours a day, five days a week . . . some for over six years.

STAMPING DIE . . . Trade name is imprinted on rubber, nylon and plastic AJAX combs with this stamping machine. Each of the four machines is equipped with a 450 W Chromalox cartridge heater. Heating cycle is about one-half second—operating eight hours a day, five days a week.

HEATING OIL . . . In the Vulcanized Rubber and Plastics Company's laboratory, a 2 KW Chromalox immersion heater raises the temperature of the oil in the kettle to 180°F. When in operation the heated oil is circulated continuously through platens in the machine that they use for testing pills.



PREHEATING . . . Metal clips for AJAX combs are heated by two 250 W Chromalox cartridge heaters to 200°F in a 30-second heating cycle on two machines. The prongs of the clips are then forced through the rubber and plastic comb material by mechanical pressure—eight combs at a time.

Vulcanized Rubber and Plastics Company solves heating problems electrically

. . . obtains low cost operating performance

Fifteen years ago the Vulcanized Rubber and Plastics Company, Morrisville, Pennsylvania, converted the heating of platens from steam to electric, in order to obtain the dry heat required for molding rubber. Results proved so successful that today this company has a long line of 72 electrically heated rubber molding presses—using Chromalox Electric Heaters.

As their plant expanded, the company added other operations that required precisely controlled heat—in varying amounts and temperatures—some of which are shown here. They readily solved each heating problem by using the specific type and size of Chromalox Electric Heater best suited for each operation.

Results over a period of years show many cost saving advantages, such as: low installation cost; clean electric heat; long heater life; continuous production. Plus automatic operation, by which temperatures are varied with ease; maintained precisely—right at the spot where the heat is used.

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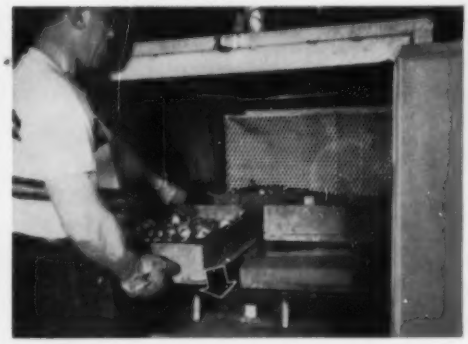
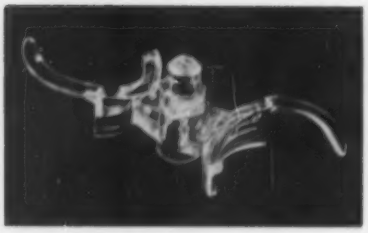
DRYING OVEN . . . Metal parts, that are to be cast in rubber in the rubber molding presses, must be completely clean and dry when they are put into the production line in the molding room. After they are thoroughly washed, the metal parts are put into an oven to be completely dried. To maintain a constant temperature of 280°F, the oven is equipped with ten 750 W Chromalox strip heaters. These strip heaters have the excellent performance record of having been in operation eight hours a day, five days a week, for over four years—with no failures.



TANKS . . . Plastic handles, produced by two injection molding machines, come from the dies at 400 to 600°F. To hold them at sufficient heat to prevent shrinkage requires two stages. First stage is to put them through the tank shown in foreground, which is kept at 180°F by four 750 W Chromalox strip heaters. Second stage is to soak them in the tank in background, which is kept at 180°F by a 2500 W Chromalox immersion heater—until time for degreasing and packing. To maintain production, these baths are in operation on a schedule of 24 hours a day, five days a week.

PLATENS . . . Used for molding rubber wheels around metal hubs, this press is equipped with six 450 W Chromalox strip heaters in both top and bottom platens—and eight 150 W Chromalox strip heaters, covered with insulation, on the outside of the die. Heated parts are kept at 380°F, in a 20-minute heating cycle. Fifteen years ago, this company converted from steam to electric platens. Results proved so satisfactory they now have 72 presses, which have been operating 24 hours a day, six days a week for approximately one year—with practically no failures.



Pattern for shuttle retainer; casting the part was superior to machining it

ess, through the use of plastic patterns, often allows considerable cost saving through the combining of several component parts into one. Further, this method often eliminates the expense of excessive waste removal. An investment cast shuttle retainer shown in the photograph above illustrates this point. Had this part been machined from bar stock, over 80% of the total blank stock would have had to be inefficiently removed in a sequence of many machining and hand operations. Forging, as an alternative, would have proved equally expensive.

Investment casting recognizes two main types of dimensional deviations or varibles. The first is the direct result of the process itself and is occasioned by minute differences in the plastic patterns, the ceramic molds, and the cast metal. The second is a direct result of the product's particular design, differences in sectional thickness, sharp corners as opposed to filleted ones, etc.

Precision Achieved

As an illustration of such variance and its cure, consider the bracket and holder patterns shown in photo at right. A ±0.0005-in. tolerance between these two parts was required. The caster produced several unsatisfactory metal parts and the writer's company redesigned the mold to accommodate for these casting variations. The resultant patterns permitted the caster to maintain the very close tolerances called for. This is quite an accomplishment when one considers that the original male pattern details were transferred to the female investment mold and they in turn were cast into a male metal pattern. This is just another example of proper team work between injection molder and investment caster to produce a close-tolerance metal product.

Design considerations are important in the production of quality metal parts, but equally essential to know about are the capabilities of plastic patterns. Dimensional accuracy, surface smoothness, freedom from warping and scratching, ability to support their own weight during gating and assembly, and infinite shelf life are a few of the more important advantages which styrene patterns enjoy over wax. The total of these advantages have greatly reduced the caster's pattern spoilage, breakage, and handling cost, resulting in increased production and lower unit cost to the consumer.

Tolerance Economics

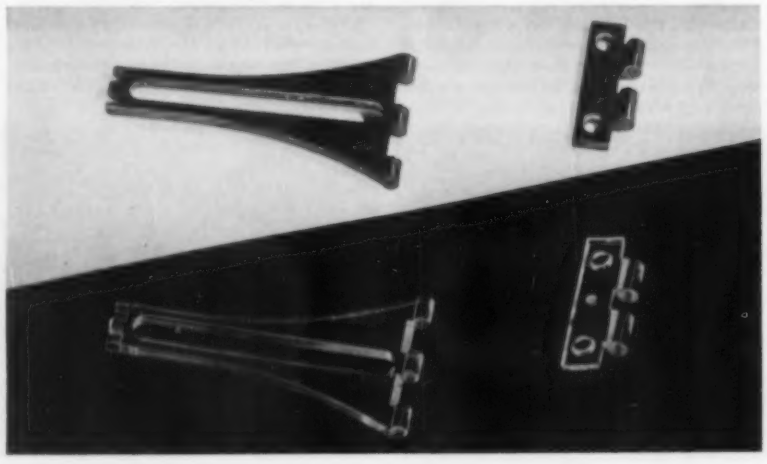
Economically, the best results are obtained when using a tolerance of not less than ±0.003 in. for the first inch and ±0.002 in. for each additional inch in the finished metal casting. Normally, both the caster and molder share equally in tolerances. In other words, half of the tolerances are given to the caster and half to the molder.

Closer tolerances can be held on patterns and, therefore, on the final castings, but not without additional expense. In many instances, due to either the complexity of the pattern shape or a demand for extremely close tolerances, the ultimate casting size cannot be entirely anticipated. To allow for this situation, the molds must be constructed to allow for adjustment of pattern size. This additional expense may prove economical in the long run if, by tightening up tolerance, a costly machining operation on the finished casting can be eliminated.

Correctly designed plastic patterns often allow the molder to combine two or more parts into one integral pattern, thus saving not only in total part cost, but also in assembly and in secondary machining operations. Also, good pattern design can often include a common gating system for both caster and molder. Another factor which has materially aided the investment casting industry is the development of experimental tooling for plastic patterns. This affords the molder, caster, and ultimate consumer an economical opportunity to evaluate sample castings for deficiencies or improvements before being committed to permanent tooling and production parts orders. A metal casting can never be more accurate than the pattern from which the investment is made.

The investment casting process is not a cure-all for the manufacture of all metal parts. The molder, the caster, and the ultimate consumer must recognize that investment casting cannot compete with less expensive processes such as stamping, automatic screw machining, and sheet metal forming in the production of simple metal parts. The purpose of investment casting is to produce parts which canot otherwise be produced to economically obtain the desired dimensions, tolerances, and contours with a minimum amount of secondary machining operations or parts from alloys which are not readily machinable.

Metal castings (top) and injection molded styrene investment patterns for bracket and holder (bottom). Tolerance of ±0.0005 in. between holder and bracket was achieved



High-Pressure Air in Reinforced Plastics Bottles

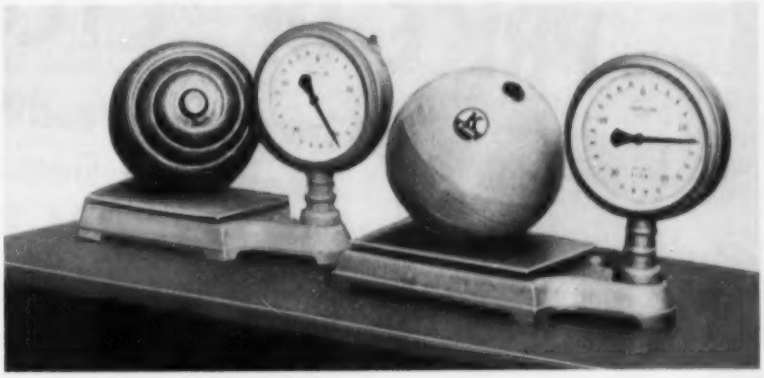
Strong storage reservoirs are produced by winding resin-impregnated fibrous glass yarn on spherical metal mandrel

by DANIEL MAPES*

EFFORTS to reduce the weight of aircraft component parts without sacrificing strength or quality is a never-ending job for engineers. Any and all weight reductions on aircraft parts increase a plane's range, payload, or fire power.

A recent development in compressed air storage reservoirs used to actuate a number of emergency and/or primary pneumatic devices on planes or on ground service trucks illustrates the results of such efforts. For years, these reservoirs have consisted of wire-bound steel spheres, the most common model holding 650 cu. in. of air at 3000 p.s.i. and weighing approximately 20¼ pounds. Its wire binding keeps it from shattering if ruptured, for example, by a bullet.

As far back as 1947 it became evident that, theoretically, a strong, plastic-impregnated fibrous glass vessel could be produced which would be substantially lighter than even an alloy steel unit. Test work was initiated at that time and during the intervening years was carried out by textile engineers, long familiar with the control of both synthetic and natural yarns and the design of textile machinery, in collaboration with aircraft equipment designers. Until recently, however, the unavailability of satisfactory materials prohibited volume production of spheres which would withstand rigorous testing. This was particularly true of the resins available.



Reinforced plastics reservoir (right) can hold 650 cu. in. of air under pressure of 3000 p.s.i., weighs only 12¼ lb.; equivalent wire-bound steel sphere (left) weighs 20¼ pounds

Epoxies Held the Key

The recent introduction of an improved epoxy completely changed the picture. Experiments with this binder resulted in an epoxy resin-bonded fibrous glass, heat-cured sphere which has equivalent physical characteristics to the steel globe, and

Photos courtesy Walter Kidde and Company, Inc.

During cycling test, pressure in sphere is raised hydraulically to 3000 p.s.i. and dropped to zero, eight times per minute, until the container fails

*Vice President, Engineering and Research Div., Walter Kidde and Company, Inc.

EXTRA *Plastic News* EXTRA

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weighs only 12¼ lbs., a reduction of about 40 percent.

Here's how the spheres are made on equipment especially engineered and built for this job. The first stage is the manufacture of a low-melting-point metal alloy sphere, the external diameter of which is equal to the internal diameter of the finished reinforced plastics sphere. The metal sphere is cast in two halves that are later joined together. This mandrel, for that is the purpose of the sphere, is now covered with a rubber liner, with light-alloy inserts for pipe connections. This liner is retained inside the sphere after completion to provide a porous-free section.

The next operation is the winding of glass roving over the rubber. The fibrous glass is supplied in yarn form. The bobbins of fiber are mounted on a creel, the ends are collected together and passed through the resin bath, after which they are slid through wipers to remove surplus resin. To aid the curing of the resin, a catalyst or hardener is added. From the impregnating stage the yarn is led into the winding machine.

This machine winds the impregnated yarn onto the rubber liner covering the mandrel. The pattern of wind insures an even distribution to absorb pressures and consequent strains to which the spheres will be subjected. On completion of the winding, the sphere is transferred to an oven for heat-curing.

The final stage in the manufacture is removal of the mandrel. To do this, steam is injected into the sphere. The metal melts, is run off, and the rubber liner is left in place, bonded to the glass by the resin.

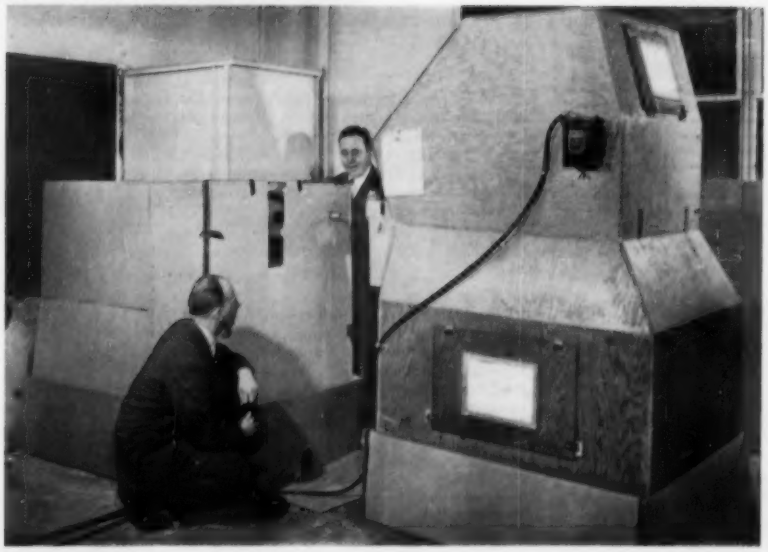
Rigorous testing follows completion of each sphere. Spheres are tested hydraulically to pressures of 1½ times the working pressure, i.e. 4500 p.s.i. The pressure is then released and any volumetric deformation is measured.

Other tests include an ultimate bursting test, which must not be less than 6700 p.s.i., a random cycling test which is designed to evaluate the fatigue life of the structure when subjected to frequent changes in pressure, and a gun fire test.

In the cycling test, pressure is raised hydraulically to 3000 p.s.i. and then reduced to zero. This cycle is repeated at the rate of approximately eight per min. until the sphere bursts. At least 20,000 cycles must be attained prior to burst for the sphere to be considered satisfactory.

The spheres are now made in volumes of from 50 to 2500 cu. inches.

Glass yarn ends are drawn from bobbins on a creel, collected together, and passed through an epoxy bath prior to being wound onto a rubber-covered sphere (see photo below)



After glass strand has passed through epoxy bath for impregnation and surplus wiped off, it is fed from the creel housing (at right in picture) to the winder housing at left

● The punch is speedily and simply cast of Marblette resilient epoxy resin, poured over the pattern held in a plaster retaining wall.

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PLASTICS*
TECHNICAL SECTION: Dr. Gordon M. Kline, Technical Editor

Integral Lubrication of Polystyrene

by RICHARD B. BISHOP†

FOR years after polystyrene was introduced, the molding of this material remained an art. Each skillful molder developed his own techniques and tricks to increase the flow and improve the moldability of this material. The materials manufacturer, in his technical service work, found it necessary to learn many of these facts and develop some of his own techniques to help the molder better to understand the sound principles of injection molding. By degrees, the laws governing the injection molding cycle are being uncovered and this art is turning more toward scientific methods each day. One branch of this study is the incorporation of efficient lubricants as integral parts of the molding powders.

Far too often the studies on lubricants have failed because of effects of other important factors that are either completely ignored or unknowingly changed, thus shifting the final results and assigning these changes to the wrong cause. Logic would therefore dictate that any study on polystyrene lubrication be done in an injection molding machine where all factors are fixed and the lubrication is the only factor that is varied.

The literature is full of tests and instruments for measuring the flow of plastics. A report (1)[1] on the latest of these instruments, "The Caplastometer," summarizes the disadvantages of these melt methods, of which six are mentioned, and then describes a new test to overcome or correct these deficiencies. Unfortunately, all of these tests suffer from one grievous fault: they measure flow of melted material, which is a viscosity characteristic of polystyrene used to make the molding compound and not a true measure of the complete molding powder. Essentially, all these methods measure the amount of plastic material that will flow through a standard hole under standard conditions of temperature and pressure. The solid material does not influence in any way the results of this test since the material is tested when it is in a melted condition.

A rule of thumb used for years in the injection machine manufacture and in molding practice is that 50% of the pressure on a ram is lost in compressing particles and passing them over the spreader. If this is true, the percentage of ram pressure reaching the nozzle is reduced in this proportion. Since flow at the nozzle is directly related to this pressure, any given molding powder will flow or fill only in direct proportion to how effectively the ram pressure is transferred to the nozzle. Thus, a study of the compression of molding material particles would be quite valuable in order to correct and improve flow.

A great deal of effort has been spent along these lines in recent years. Our first approach to this thought was to drop a plumb-bob-shaped instrument with a graduated tail into the molding powders to see how far it sank. Unfortunately, no correlation could be obtained with lubricants because we neglected the factors of confinement and the resulting pressure and packing that occur as a ram pushes compact material over a spreader. However, these studies showed that the following factors influenced packing and pressure transfer: 1) size, shape, and uniformity of particles; 2) cleanness of cut in grinding operations (dull knives produce feathering edges which act as springs when particles are compressed); 3) lubricants aid a great deal in slipping one particle over another and help packing: for example, a typical test showed the bulk factor of identical samples to be increased from 584 g./l. for unlubricated material to 658 g./l. for externally lubricated material; 4) the variables in the particle area and size cause different lubricant effects with same percent lubrication.

This study also indicated that investigating each variable alone was completely false and that a test must be developed that contained by its very nature all variables in molding, even if each was not entirely controllable. Thus, selection of conditions on any molding machine would fix a number of variables, such as capacity of cylinder, wattage of heaters, shape and design of spreader, and nozzle.

Factors Affecting Flow

When we started our research project, a meeting was held to determine factors in molding that influence flow. Among the factors that were given serious consideration are the following:

1. Ram forward-speed and smoothness of operation are an indication of effectiveness of the external lubricant.

2. Internal lubricant changes mostly fluid flow in liquid plastic and has little effect on the pressure at the nozzle.

3. The injection cylinder should at least be considered as two sections—a solid section and a liquid section. All variations between these extremes also exist.

4. Cylinder wall lubrication is less important than particles lubrication mainly because of the smaller area involved.

5. The solid section of molding

* Reg. U. S. Pat. Off.
† Foster Grant Co., Inc.
[1] Numbers in parentheses link to references at end of article, p. 148.

Table I—Internal Lubricants

Material	Supplier	Material	Supplier
Ohopex R-9	Ohio-Apex Div., Food Machinery Chemical Corp.	Glaurin	Glyco Products Co., Inc.
Aroclor 1232	Monsanto Chemical Co.	Octyl palmitate	Rubber Corp. of America
Aroclor 1268	Monsanto Chemical Co.	Fractol A	Esso Standard Oil Co.
Triphenyl phosphate	Monsanto Chemical Co.	Elvanol	E. I. du Pont de Nemours and Co , Inc.
Dicyclohexyl phthalate	Ohio Apex Div.	Tallow alcohol	DeBell and Richardson, Inc.
Resin 276 V2	The Dow Chemical Co.	Santicizer 1-H	Monsanto Chemical Co.
Butyl Cellosolve stearate	Deecy Products Co.	Chlorinated paraffin #40	Hooker Electrochemical Co.
Butyl stearate	Deecy Products Co.	M.P.S. 500 (chlorinated ester of fatty acid)	Hooker Electrochemical Co.
Resin 276 V9	The Dow Chemical Co.	Dow 77 (tri-p-tert-butylphenyl phosphate)	The Dow Chemical Co.
Lubricin N-1	Baker Castor Oil Co.		

material in a cylinder is shaped like a bullet and the boundaries nearest the walls melt first; thus, the nose and solid section going over the spreader give the highest degree of resistance.

6. The liquid-section flow is laminar and sticking to side walls hinders this flow. Higher melting lubricants that stick to side walls of the cylinder would probably tend to aid this section.

7. Any actual measurement of flow should be done in a mold calibrated so that differences can be determined.

After getting into the test program, a very serious difference was noted when the mold for testing flow was changed. A test cavity 0.030 in. thick would best measure differences in internally plasticized materials, while a thicker cavity indicated the best external lubrication. Both types of cavity were used in the test procedure.

Recent publications (2,3) have shown that many of these concepts are held by others. However, they translate these concepts into theoretical considerations of granule flow, fluid flow, heat exchange, heater design, and temperature measurement. By-passing such theoretical items at this time, we developed a procedure using an injection machine with no special features which can test the flow and lubricating characteristics of any material. This test compares these materials as to whether they have better external lubricants or better flow characteristics, and it allows the molder to predict operating characteristics of a new material. This is desired with the advent of the many new types of molding compounds appearing today and the many others which are possible tomorrow (4).

Materials Investigated

In the study of lubricants, various commercial materials were analyzed for specific properties. The term "integral" in the title of this article means complete and encompasses

Table II—External Lubricants

Material	Supplier	Material	Supplier
Acrawax C	Glyco Products Co., Inc.	Calcium stearate	—
Armid HT	Armour Chemical Div.	Magnesium stearate	—
Carlisle Wax 280	Carlisle Chemical Works, Inc.	Barium stearate	—
Lubricant 285	E. F. Houghton and Co.	Aluminum stearate	—
Silicon mold release	E. F. Houghton and Co.	Lithium stearate	Metasap Chemical Co.
Castorwax M.P. 80	Baker Castor Oil Co.	Lubricin N-1	Baker Castor Oil Co.
Elvanol	E. I. du Pont de Nemours and Co., Inc.	Glyceryl monostearate	—
Flexricin 15	Baker Castor Oil Co.	Dodecyl alcohol	—
Ensol LM	Baker Castor Oil Co.	Pluronics	Wyandotte Chemicals Corp.
Rust Veto White	E. F. Houghton and Co.	Nopco 2225V	Nopco Chemical Co.
Release 7118	E. F. Houghton and Co.	Nopco 22 DS	Nopco Chemical Co.
Z 86	E. F. Houghton and Co.	Neofat	Armour Chemical Div.
Lubricant 0	E. F. Houghton and Co.	Undecyl stearate	Kessler Chemical Div.
Paracin 1	Baker Castor Oil Co.	Adol 64	Archer-Daniels-Mid'and Co.
Tallow alcohol	DeBell and Richardson, Inc.	K 5893	Colloid, Inc.
Sperm oil	Archer-Daniels-Midland Co.	Butyl Cellosolve stearate	Arnold Hoffman and Co., Inc.
Thexin	Baker Castor Oil Co.	D. C. Emulsion 8	Dow Corning Corp.
Nopco 11968	Nopco Chemical Co.	Armid O	Armour Chemical Div.
Castorwax M.P. 70	Baker Castor Oil Co.	Armid C	Armour Chemical Div.

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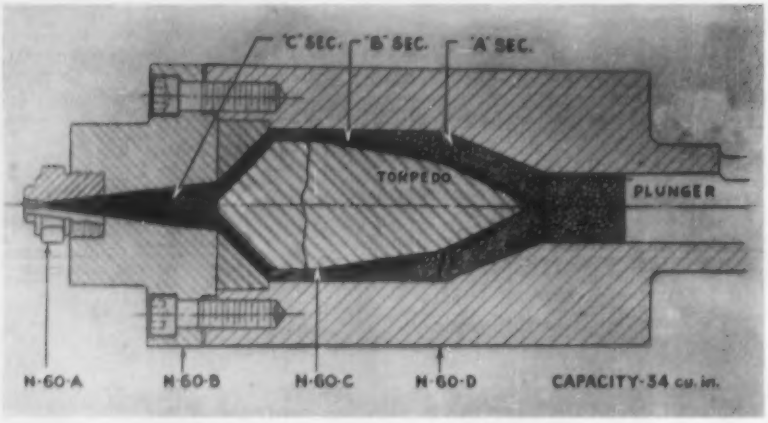

Fig. 1—Design of injection molding cylinder used in experiments described in this article

the effect of lubricants on the overall molding picture.

Lubricants in general can be classified as external or internal. Internal lubricants can almost be considered as plasticizers. These plasticizers, or softeners, are to be used with care since they have a degrading effect on some of the properties of polystyrene. The greatest effect of such internal lubricants is in the flow into a thin wall section and all materials using them are referred to as high-flow materials. Representative internal lubricants or plasticizers tried in our investigation are listed in Table I, p. 142.

External lubrication was more critical since many lubricants that would reduce friction could not be incorporated into a molding powder for one or more of the following reasons: 1) they are colored; 2) they produce haze; 3) they cause lamination due to incompatibility; and 4) they cause breakdown of polystyrene.

General classes of external lubricants tried in our tests were fatty acids and their derivatives, metallic soaps, waxes, and others. A representative list of external lubricants studied is presented in Table II, p. 142.

From the fatty acid group and derivatives, stearic acid of high purity showed good results. It is highly compatible with polystyrene and its clarity is excellent. However, its low melting point causes bubbles in the molded pieces and to avoid this, higher molding pressures are necessary.

Metallic soaps in general cause haze and cloudiness. The best of this group is zinc stearate (5). It gives excellent lubrication but if in concentration above 0.1% haze occurs. In presence of water haze can occur at even lower concentration.

The waxes are a varied lot. The best among this group are the bis-stearamides. They give good lubrication for the particles in external state. Samples of both ethylene and methylene bis-stearamide were tested. The higher melting material is superior. There is also some evidence that this type of lubricant helps in the fluid stage of the injection cylinder. These materials melt in the range of 130 to 140° C. Work on making a higher-melting derivative of this type is still going on. Commercial products of this type are Acrawax-C, Carlisle 280, and Nopco Wax 22-D.S.

In general, liquid lubricants are not successful and cause tackiness and caking in the cylinder along with bubbling. Wetting agents act as good lubricants but produce excessive bubbling and sometimes cloudiness. The wetting agents tried were not effective in reducing static charges if included in the molding compound although such claims are made.

The effect of external lubricants is mostly in the solid section of the injection cylinder; they usually also reduce frictional losses of pressure. On checking the external lubricants in the Tinius Olsen and modified melt index tests, it was found that little or no effect was noticed in these tests. This confirmed the statement that external lubrication reduced friction in the cold part of the cylinder. As mentioned above, there are some external lubricants that become incorporated as a softener and also act as internal lubricants.

Some external lubricants are excellent because they can be put into polystyrene in relatively large amounts without causing haze and cloudiness. Stearic acid, triple-pressed and of a special grade that has a low iodine value, is one of these. Some similar materials have been found effective up to 100 g. per 100 lb., but there is a point above which additional lubricant accomplishes no further reduction in friction. This must be determined for each size of molding particle and each lubricant.

Test Procedure

To describe more clearly the test procedure for measuring the effect of lubricants, Fig. 1 shows an injection molding cylinder. The design is one that through the years has been very efficient, trouble-free, and in

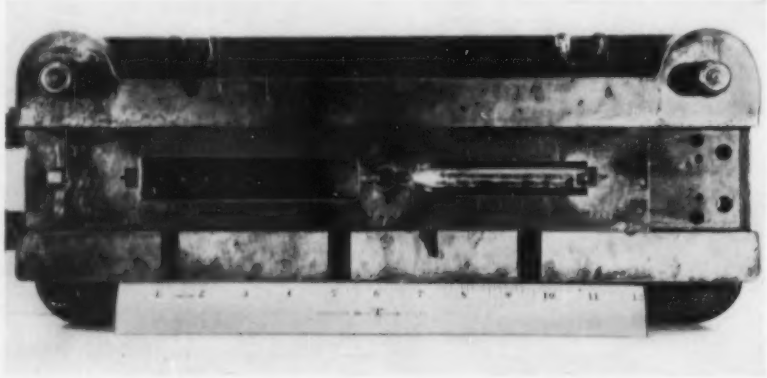

Fig. 2—Die used to mold test pieces of polystyrene (see sketches of moldings, p. 146)

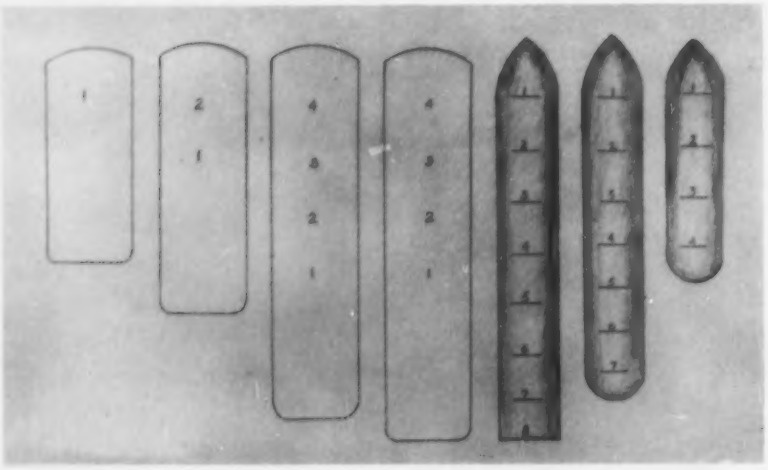

Fig. 3—Sketches of some of the specimens molded to test effect of lubricants

constant use at Foster Grant. The "A" section is that portion in which solid material is being packed and passed over the torpedo. The "B" section has some surface liquefaction, but is mostly still solid. The "C" section is the fluid or molten stage. It is the successive stepwise advance of molding compound as the plunger keeps pushing material into Section "A" that makes our test procedure a success. The molding machine is set up under good standard conditions—conditions under which an experienced mold operator knows a material will perform satisfactorily. These conditions are then maintained constant and locked in on such a standard cycle.

A mold cavity or die, as shown in Fig. 2, is put in place and a series of pieces are molded under the standard conditions. Standard material molds so that the die is not filled completely. Now, any change in the moldability of another molding material will give a longer or shorter piece. Samples of these pieces are illustrated in Fig. 3. Once the standard piece length and condition for obtaining this piece are established, then we are ready for comparative tests. If a molding material possessing better flow characteristics than the standard is put into the machine under the same conditions, then the piece will become longer; if a material with poorer flow characteristics is added, then the piece will be shorter.

As each shot is made, the molding material passes successively through Sections "A," "B," and finally "C" of the injection cylinder. Due to this progressive passage from solid to semi-solid to fluid matter, any injection molding material can be graded against a standard material and be rated either better or worse than the standard material. Thus, a material better externally lubricated will show up, just as will a material which is better internally lubricated, but at a different stage or part of the cycle. The test will distinguish better internal or external lubrication, but at a different time from the start of the test.

It can easily be determined how many shots are necessary to remove material from Section "A" to "B" to "C" (Fig. 1) of any injection machine and this knowledge can then be used to translate any diagram obtained.

The molding conditions for our standard material used to determine the diagrams in Figs. 4 to 8, inclusive, are as follows:

Travel time of plunger: 1¾ sec.

Pressure: 600 lb.; after 1¾ sec. pressure was dropped to 200 p.s.i. to assure plunger stop.

Molding cycle: 23 sec.

Molding temperature: 470° F.

Using the system described above, all the internal and external lubricants were tested. The more promising materials were then further investigated to find out the maximum amounts of each lubricant that could be added to polystyrene molding powders.

Experimental Results

A few of the diagrams developed in our laboratory using this test procedure will illustrate the results obtained. "Stage," as used on the diagrams, represents the time after the start of the test procedure. "Section" refers to the sections of the injection cylinder as illustrated in Fig. 1.

Example 1—The number of shots as plotted against the height of the shot from successive pieces for a standard molding material are shown in Fig. 4. This graph indicates that the machine is in steady control; this would go on indefinitely unless molding conditions were changed in some way.

Example 2—If this molding machine, which is charged with a standard material of known lubricant and flow properties giving the standard height bar, is now charged with another or different material, let us say the same material but containing a different external lubricant, a diagram like Fig. 5 might be obtained. Stage 1 includes shots from our standard material. In Stage 2, the second material starts to enter into the solid "A" section of the injection cylinder. If the second material is better externally lubricated, then an immediate rise will occur in

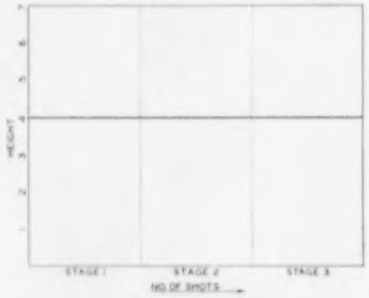

Fig. 4—Number of shots plotted against height of shots of successive pieces for a standard molding material

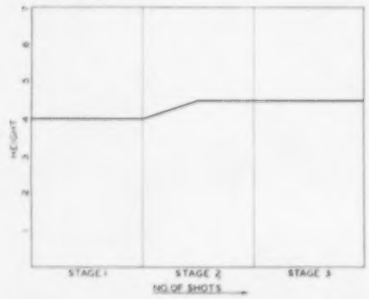

Fig. 5—Height of molded pieces, using same material as in Fig. 4, but with better external lubricant entering at Stage 2

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@ 90° C. – Weight Loss %	3.6	3.6	3.3	6.0	5.5
LOW TEMPERATURE PROPERTIES					
Clash and Berg – Tf[3]	−29.4 C.	−30.5°C.	−29.3°C.	−28.4°C.	−30.3°C
Brittleness – SPI Impact[4]					
Passed	−35.0 C.	−35.0°C.	−30.0°C.	−30.0°C.	−30.0°C
Failed	−40.0 C.	−40.0°C.	−35.0°C.	−35.0°C.	−35.0°C

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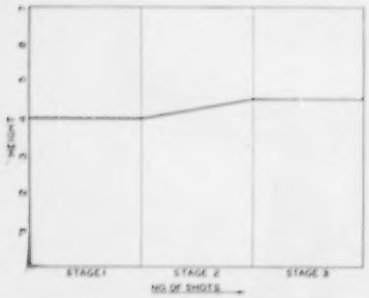

Fig. 6—Change in height of molded pieces resulting from addition of better external and internal lubricants

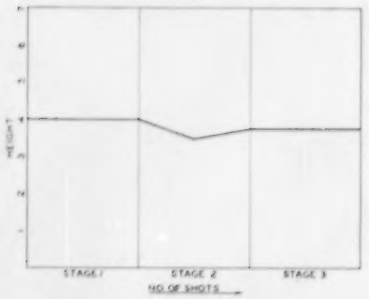

Fig. 7—Height of molded pieces when a second material with external lubrication inferior to that of first is used

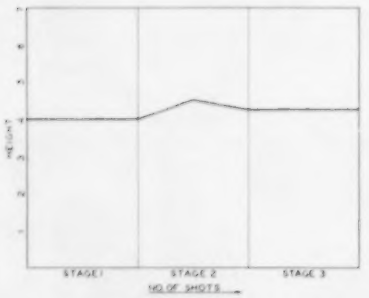

Fig. 8—Height of pieces with material 2 better externally and poorer internally lubricated than material 1

the height of the molded piece because of reduced friction and more of the ram pressure reaching the nozzle. Now, as the second material enters into Section "B" of the injection cylinder and the molding powder becomes fluid or liquid, the liquid characteristics of the material start to take over. Since in this case, the second material is the same as the first except for better external lubricant, no further change in height of molded pieces is noted.

Example 3—If the second material is both better externally lubricated and better internally lubricated, then a diagram as suggested in Fig. 6 is obtained. The interpretation up to the middle of Stage 2 is the same as Example 2; but as the second material enters Section "C" of injection cylinder, the fluid nature of the molding compound takes over and a further increase in height in molded piece occurs. The second half of Stage 2 as shown is a continuation of the first half of Stage 2. However, the increase is more likely to be less than in the first half of Stage 2. In Stage 3, the second molding powder has completely replaced the first in the injection cylinder and no further changes take place.

Example 4—A diagram with the structure in Fig. 7 is interpreted as follows: Material 1 has a better overall flow than material 2. As material 2 takes over in Stage 2, the piece gets shorter indicating that external lubrication is not as good as for material 1. However, as material 2 gets into the fluid section, there is some recovery of lost height of piece, indicating that it has a better liquid flow than 1.

Example 5—The interpretation of the diagram in Fig. 8 is as follows: Stage 1 represents standard conditions for molding material 1. The first half of Stage 2 represents where material 2 is taking over in the solid section of the injection cylinder; the second half represents where material 2 is taking over in the liquid portion of the injection cylinder. Stage 3 represents standard conditions of molding material 2. Stage 2 study is the most important factor for consideration. Thus, material 2 is better externally lubricated than 1, but is poorer in fluid flow characteristics than 1.

Many additional factors, which constantly creep into discussion of flow and which future research will answer, are of interest. Does the control of molecular weight influence the flow in the liquid section of the injection cylinder? It seems that a variation of 20% in molecular weights from current production does not change the flow as recorded by melt index or Tinius Olsen tests by more than 5%. Much more work over a wider range is indicated here. The nature of the slope of viscosity index over a wide range of temperatures may put a different light on liquid flow. Or better still, why not manufacture polystyrene with nearly the same viscosity over the whole range of injection temperatures. This would assure more uniform molding conditions. Perhaps viscosity index improvers can be added (maybe some of the new graft and block polymers).

The control and reduction of monomer content in polystyrene has raised heat-distortion temperatures, but it also removes some internal plasticizer which previously helped in our molding cycles. This should not be returned to our polymer, but certainly the search for solid internal plasticizers that do not reduce the heat distortion of our molding powder should continue. These materials should melt above 200° F., and should effectively act at injection cylinder temperatures to reduce the viscosity to a minimum but quickly freeze the molded plastic item in the cavity.

The search for external lubricants will continue since this could be the most fruitful spot for increasing injection machine pressures at the nozzle. Preplasticizers reduce considerably the time of solid state material in injection cylinders and lessen the external lubricant problem, but do not altogether eliminate it since lubrication in the first plunger is still necessary.

I wish to acknowledge the valuable work and suggestions of the research staff at Foster Grant in preparing this article.

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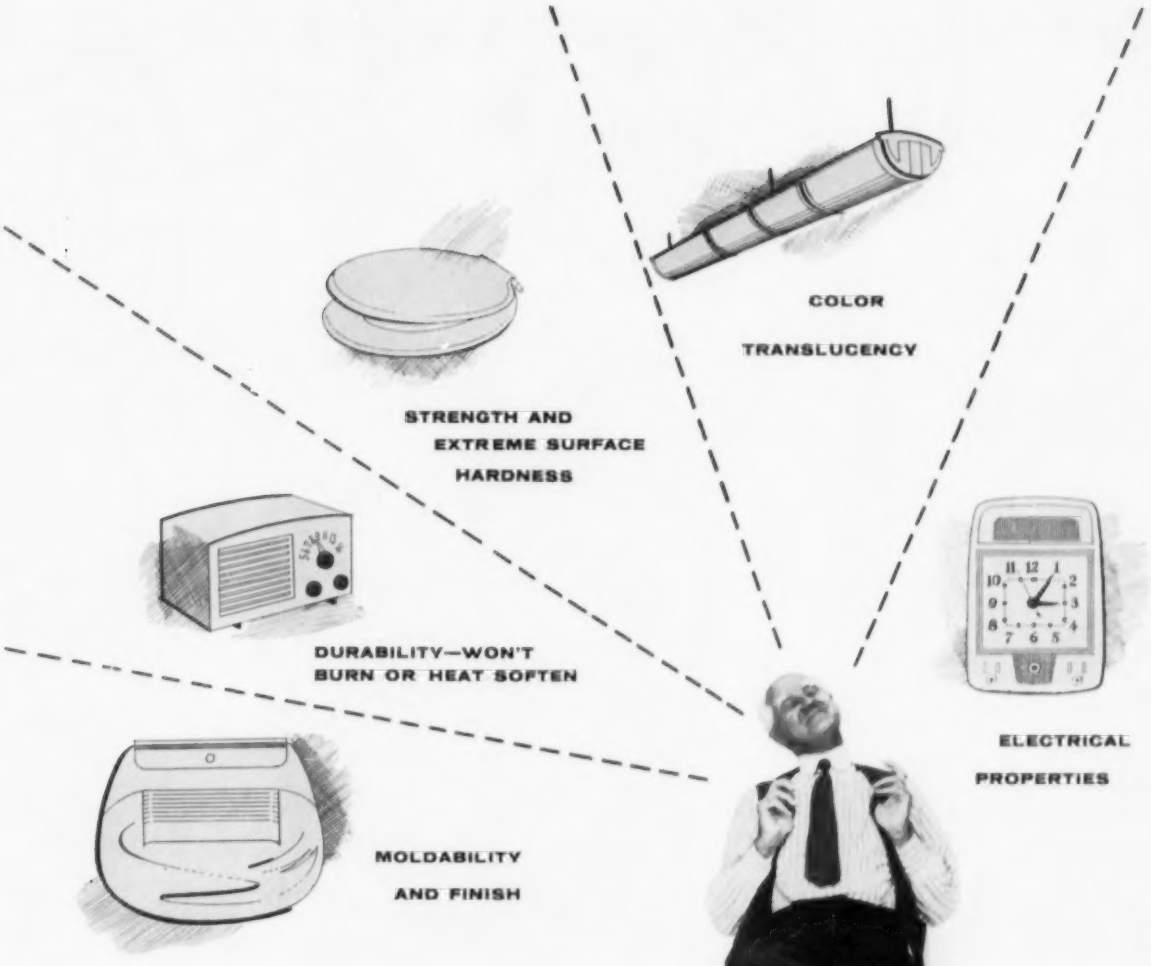

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Soil Stabilization

by Synthetic Resins

A review of recent and current work as presented in the literature cited

by THOMAS A. MARKUS*

IN MANY building, civil engineering, agricultural, and military operations, the need arises to alter, temporarily or permanently, the properties of the soil found on the site. The properties that may need alteration include any one or more of the following: mechanical strength (including tensile, compressive, and shear strength, as well as cohesion), elasticity, permeability, water resistance, volume-change propensity, chemical inertness, and surface-wearing properties.

There are three approaches to adjusting a soil that is in some manner unsatisfactory: 1) *by-passing*, as for instance when load-bearing piles are driven through to a rock stratum; 2) *removal* of the defective soil and replacement by new materials; and 3) *treatment* of the soil by mechanical, physical, or chemical methods. The division among these latter three systems of treatment is often not clear-cut, as a system may have stabilizing effect as a result of both physical and chemical processes.

The mechanical system chiefly employed is the compaction of soil. By this means its density, and hence its strength, permeability, compressibility, and other engineering properties, can be altered.

Physical systems include the grading of soil by carefully balanced proportions of fine and coarse material; thermal treatment, by which some soils can be permanently dehydrated and others can be temporarily frozen, thus altering their engineering properties; and electrical treatment of soil (1)[1] by which means drainage can be improved and new structural qualities can be added to the soil. By this latter means, pore water will flow towards one of the electrodes (a phenomenon known as electro-osmosis); this flow is accompanied by a volume change in compressible soils. In addition, ion exchange will take place between ions attached to the surface of soil particles and ions present in the pore water or carried in the electric current; also, metal salts may be deposited in the soil pores as a result of the electrochemical decomposition of the electrodes, which salts may combine chemically with soil particles, thus having a cementing action.

* Massachusetts Institute of Technology

[1] Numbers in parentheses link to references at end of article, p. 158.

Chemical Stabilization

Although mechanical and, to a much lesser degree, physical methods will continue to be used, they have the limitations of not being universally applicable. Many soils, particularly those containing clay, will not be satisfactory, even after mechanical treatment. For this reason, a third means of stabilization, although usually more expensive, has for some time been investigated; this is *chemical stabilization*. In this process, materials are added to the soil that change its properties either by a physicochemical interaction with the soil particles themselves or by the formation of a matrix between the soil particles. The reaction involved may be simply a phase change, or it may be the formation of a new material through a chemical reaction, or a combination of both of these. Most of the chemical stabilization systems currently practiced are of the matrix-forming type, in which the two most important materials are Portland cement and bitumens.

Portland cement is used as an injected grout in undisturbed soils and as a powder mixed into natural soils and then compacted. It acts as a binding cement. Since the resulting substance is fairly rigid, a sound base is required to prevent cracking, and this necessity limits the use of the system.

Bitumens used are of the tar or asphalt types, the latter chiefly limited to cut-backs, road oils, emulsions, and other liquid asphalts. Here again, a fairly strong base is required, since the soil-bitumen is able to spread the load over a limited area only. Other difficulties present themselves in using this method of stabilization. First, it is only suitable for use with specified types of soils. Second, the setting action can only take place in suitable weather conditions. Third, heat-producing equipment is required unless a volatile cut-back material or a water emulsion is used. The curing time required is considerable, which is a strong disadvantage when emergency (say military landing) operations are involved.

The chlorides, especially sodium and calcium, have been tried as stabilizers and have had some acceptance. Calcium chloride furnishes calcium for ion exchange and also helps to control the water content of the soil. Although the chlorides have certain desirable effects, chiefly that of reducing the freezing propensity and also making the soil structure more open and therefore quick-drying, they do not seem to give any increased strength to the soils.

The strictly chemical type of stabilizers depend on four types of reaction:

1) *Ion Exchange*—One ion attached to the soil is replaced by a different ion from the admixture, and thus the soil properties can be basically changed.

2) *Precipitation*—An insoluble compound can be obtained from the reaction of several compounds, which will precipitate and thus act as a cementing agent. The precipitation of calcium silicate from solutions for sodium silicate and calcium chloride is an example, as is the action of Portland cement.

3) *Polymerization* — Many substances can be made to polymerize, either with each other or by them-

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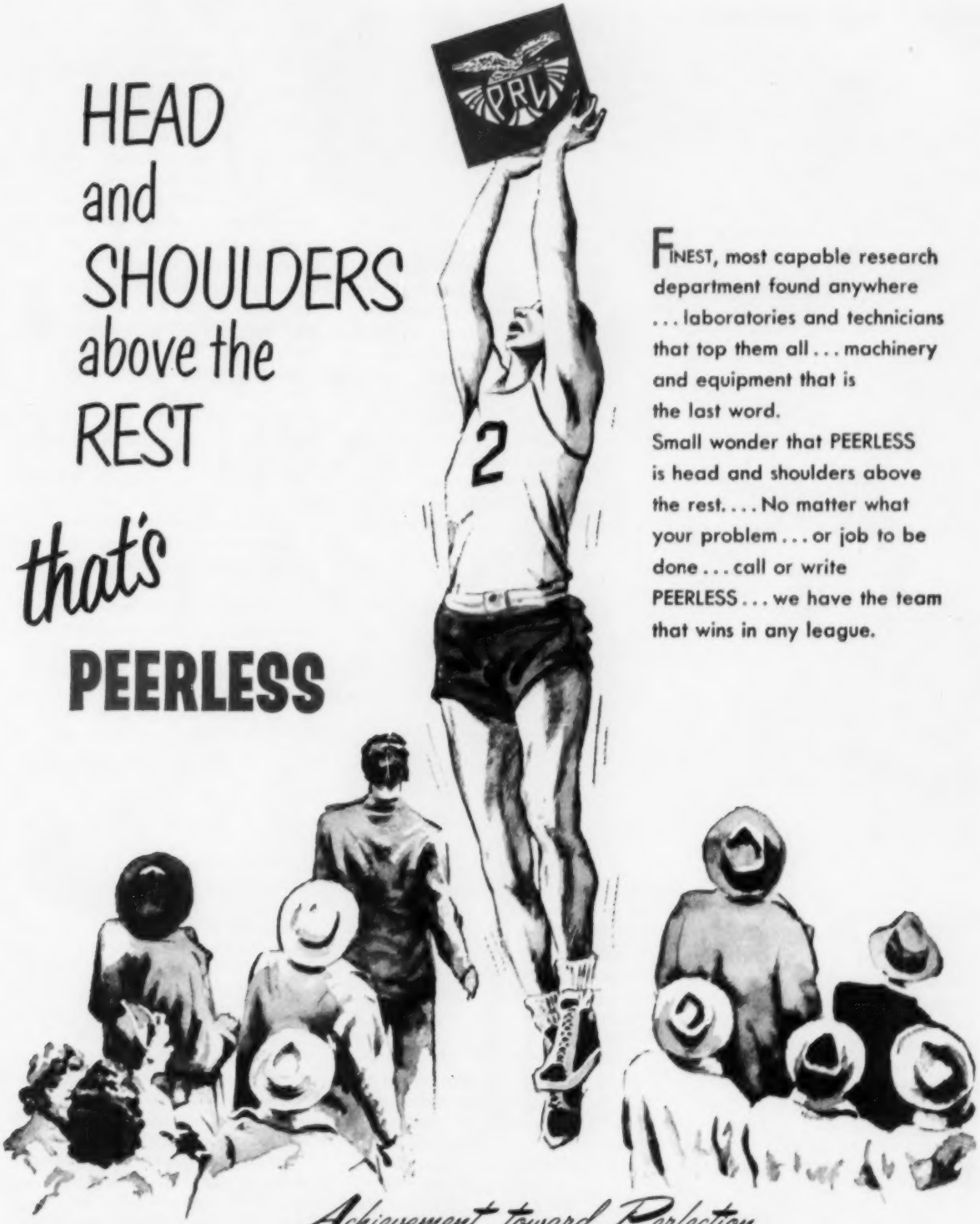

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selves, to form long-chain molecular configurations.

4) *Oxidation* — The stabilizing agent can be produced by oxidation An example of this system is the chrome-lignin method developed at Cornell University (2).

Natural Resins

Vinsol—This is a resinous substance obtained by extraction of pinewood. Its chief value in soil stabilization is in its water-repellent qualities. Much work has been done on this both in Britain and the U.S.A. (3).

Rosin—As early as 1935 experiments using this material were carried out in Russia (4). It is produced from pine tree exudations, and its chemical composition is chiefly abietic acid. Its stabilization effect is chiefly caused by the formation of a gel after reaction with certain metallic salts, the best results being obtained with rosinates formed with iron and aluminum salts. Rosin derivatives, such as Resin Stabilizer 321 and Stabinol, have also proved effective. The first is a salt composed of one molecule of sodium abietate and three molecules of abietic acid. Treatment with this substance reduces the moisture absorption of soils (5). When combined with three parts of Portland cement it gives Stabinol, a material that seems to be effective in the waterproofing of all soils (6). Two patents for the use of pine wood rosins and other substances are held by Miller, United States Patents 2,323,929 (1943) and 2,357,124 (1944).

Lignin—This resinous alkali liquor, of which great quantities are produced as waste in the paper industry, has been used as a soil stabilizer. It has definite waterproofing properties, although they are inferior to that of Vinsol (7).

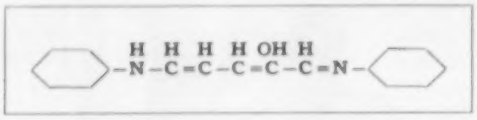
Natural Resins (tropical)—Wallaba resin, Manila copal, Damar, Belgian Congo copal, Hal resin and Niger paste have been tried. Of these, the only success has been with Manila copal and Wallaba resin. Derivatives of these have also been used, but all of them have had only limited success (8).

Oils—A number of natural and modified oils have been tried to render polyvinyl acetate water repellent. Among these are tung, linseed, soybean, perilla, turpentine, cottonseed, and oiticica (9).

Plasmofalt—Recently much work has been done in the U.S. Marine Corps on beach-sand stabilization with this substance, which is a polymerized asphaltic fuel oil and powdered dehydrated molasses composition (10). The aldehydes in the sugars of a completely dehydrated molasses are polymerized, by means of high temperature and a suitable catalyst, with the phenols of the asphalt base of the heavy residual fuel oil; at the same time, the molasses carbohydrates are converted into asphaltic hydrocarbons. The soft mixture thus becomes a hard, resinous material with many of the characteristics of both a natural asphalt and a synthetic resin or of a natural asphalt containing a high percentage of synthetic resins. Some promising results were obtained with this substance. It has also been successfully tried for building bricks. In combination with a rubber latex it gives a tough, elastomeric product.

Synthetic Resins

Much of the recent research on the chemical stabilization of soil has been in this field. The chief aim has been to find a material that will impart such mechanical strength to the soil that it will be able to bear loads in a comparatively thin membrane of treated soil. Thus, instead of a thick build-up, perhaps totalling 8 to 12 in., consisting of one or more base layers and a thick surface of high shear strength, the load could be carried by a thin layer, perhaps only 3 in. thick, which had been given tensional properties and was elastic, thus deflecting under a local load but spreading it over a wide area.



Formula 1

Aniline-Furfural Resins — This was perhaps the first group of synthetics to be thoroughly investigated in this connection. Hans F. Winterkorn was responsible for most of the research (11). His experiments on various resins of the cheaper group, such as urea-formaldehyde, urea-furfural, aniline-formaldehyde, and aniline-furfural showed the latter to be the most promising. It was found that the most effective proportion of substances was that of about one part of furfural to two parts of aniline. Its probable chemical formulation is shown in Formula 1.

After field tests, the proportion of 30:70 was finally recommended. The aniline-furfural compound seemed to act in the soil mainly as a binder, comparing favorably with cement in this respect. It also had a waterproofing effect equivalent to the effect of liquid asphalt. The most effective proportion of resin to soil was about 2:100 by weight, although this had to be varied with cohesionless soils and heavy clays, for which greater quantities were required. The best catalyst seemed to be aluminum chloride, while ferrous chloride was found to be a close second best.

In the early experiments, Winterkorn, Mainfort, and others, depended mainly on the formation of a trimer for success. To increase the effectiveness of these resins, molecular chains of greater length were attempted. Pitch and other classical materials have been employed in an attempt to do this; however, it was found more successful to do this by the introduction of polyfunctional units. The new modifications tried out by the Navy Dept. were named X-25 and X-26. Most of the experiments were carried out on beach sands, where an excellent load-bearing surface was obtained in 2 hr. or less by the addition of the resin and catalyst. Test roadways, in which the soil was impregnated to an average 6-in. depth, have also been built and good experimental results have been obtained. The resulting pavements proved to have excellent water resistance, but were unable to withstand an unlimited amount of traffic, from the frictional point of view, without the resin being subjected to further treatment.

Urea-Formaldehyde—Both Winterkorn (12), and Olmstead and Klipp (13) made experiments using this resin. The latter tried experiments with Urac 103 and Urac 180, as supplied by American Cyanamid Co., and also on U.S. Plywood Corp.'s urea glue, Weldwood. Although the experiments showed some success, the stabilized sands broke down under a moisture con-

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tent higher than 5% of the dry weight of the sand.

Urea Furfural and Phenol Furfural—Winterkorn experimented with these substances, but the results were poor, whether used alone or as mixtures with aniline-furfural or rosin. Recently, aniline-furfural resins have been modified by the use of polyfunctional amines (14).

Phenol-Formaldehyde—No success has been obtained with this material so far, because of its inability to set at low temperatures without pressure. British Patent 569,489 to Blott covers a system for soil stabilization with phenol-formaldehyde in some detail.

Calcium - Sulfamate - Formaldehyde—Winterkorn's tests do not show promising results for this material; but little work has been done on this resin so far, and the fact that the resin is easily formed by exothermic reaction may hold promise for future research.

Furfuryl-Alcohol—Laboratory results for the resin formed by the interaction of this compound with sulfuric acid have been very promising. It imparts good strength as well as water resistance in sand and loam soils. Tests have shown that oven-baking increases the strength greatly (15).

Polyvinyl Alcohol—Several grades of polyvinyl alcohol give good results with dry specimens (16). However, the polymerized substance is slowly washed out of soil by water, so for effective use it has to be combined with a water repellent. Among those tried have been various natural oils such as cottonseed, perrille, tung, Mexican oiticica, and soybean. Other water repellents tried included melamine, ethyl cellulose, dimethylol urea, and Vinsol.

Ethyl Cellulose—Lacquers of this material have been tested but did not give promising results.

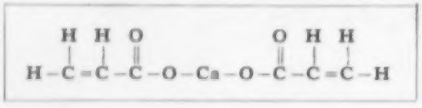
Methylol Urea and Melamines—Varying results have been obtained, the best being with dimethylol urea; but the wet strengths of all were low. The melamine used is an alcohol-modified melamine-formaldehyde. Although good results were obtained with dry specimens, upon immersion in water there was a 50% loss of strength. The resin will eventually set at room temperature.

Resorsabond—This is a two-component substance, containing resorcinol and an aldehyde, with a filler. By varying the proportions of the components, different soil stabilizing properties were obtained. Laboratory tests carried out so far have not shown much success (17).

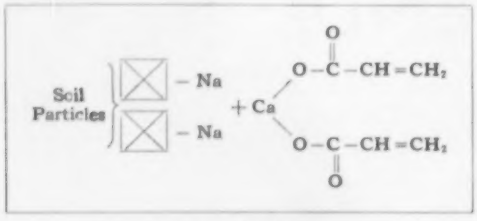
Acrylic Compounds

Probably the most promising area of research in recent years has been in the field of the acrylates, chiefly calcium acrylate. Most of this work has been carried out at Massachusetts Institute of Technology, under contract with the Army (18). Calcium acrylate is an organic salt with a molecular structure as shown in Formula 2.

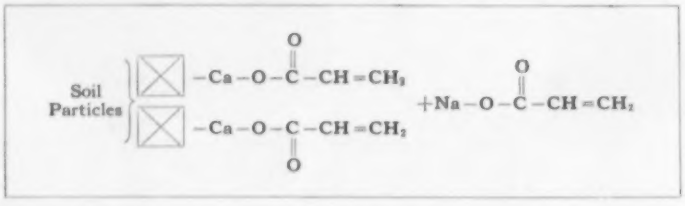
Its soil stabilization effect is the result of a double process. First, the acrylate ionizes in the presence of water (either added with the acrylate or already present in the soil) to form, among other ions, a positively charged calcium acrylate ion. This can become attached to the soil particle by replacing (say) a sodium ion in a typical base-exchange reaction. The displaced sodium can react with a negatively charged acrylate ion to form sodium acrylate. The second stage is the actual polymerization of the acrylate, both that attached to the soil and that remaining dissolved in the water. Long-chain polymers are formed, thus chemically linking the soil particles and the solution in a complex, three-dimensional chain (see Formulas 3, 4, and 5).



Formula 2



Formula 3

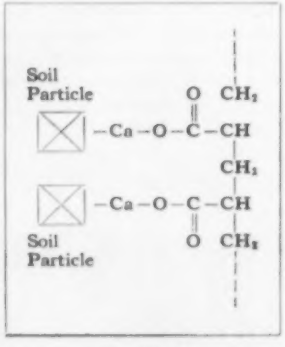


Formula 4

The catalyst used to carry out the polymerization is a redox system, that is, a combination of an oxidizing agent and a reducing agent. Ammonium persulfate is used for the former and sodium thiosulfate for the latter. Experiments have been made to find other, more effective catalysts, with no definite results so far (19).

A strong, flexible product is formed that has considerable tensile strength, is water repellent, impermeable, resilient, and has a much decreased volume-change propensity under the action of water content changes. The gel formed is permanent and gives the soil altogether new qualities. A comparatively thin layer of treated soil, say about 3 in., will support some traffic, but further tests are necessary before its value can be determined.

The time taken for formation of gel is affected by the amount of catalyst and the total soaking time. The calcium acrylate can be improved by copolymerization with other monomers; the only published information concerns N-methyloacryla-



Formula 5

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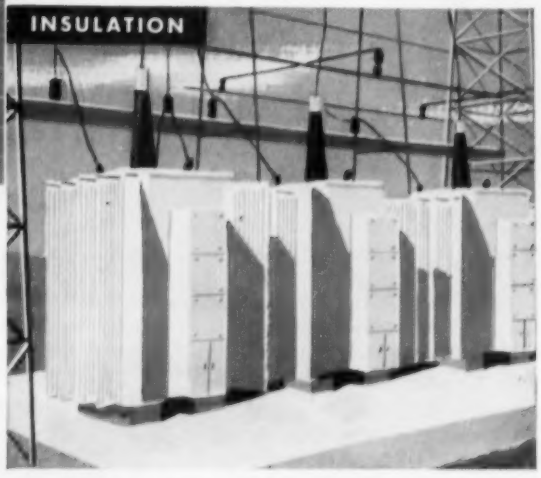

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mide (20). Lead acrylate has also been used under heat and pressure as a polymerizing agent in sodium-montmorillonite soils (21). The action of calcium acrylate is more marked in fine-grained than in coarse sand. The amount of water and oxygen present during mixing and polymerization is crucial (22). When the gel is dry it is hard, but becomes plastic again under the action of water (23).

The amount of acrylate required is dependent on the soil and the use to which it is put; a very approximate general estimate might be 4 to 8% by weight as compared with about 6 to 12% for Portland cement or bituminous stabilizers (24). The chief advantages of the acrylate stabilizers are the speed of setting, applicability to soils not treatable by cement or bitumens satisfactorily, and their ability to treat soils with high water contents. The cost of the material is greater at the moment than for traditional stabilizing agents, since no large-scale plant production is in progress. But a commercial forecast for uses of the acrylate shows that it might compare favorably with these other materials when in quantity production (25). In addition to mixing the acrylate into the soil by mechanical means, it can be injected into inaccessible positions. Experiments in spraying it from the air, i.e., in military beach-stabilization actions, have yet to be carried out.

The equipment needed for mixing the acrylate with the soil is comparatively simple. So far the standard bituminous pug-mill has been found to be the most suitable, although, ideally, a new piece of equipment would be required (26). Although acrylates may have great advantages over other stabilizers, their use will be limited by their high cost, a factor which may remain unchanged for a considerable time.

Stabilization of soils for civil engineering purposes has been widely practiced. In this field the synthetic resin stabilizers may, as we have seen, play a very important part in the future in replacing stabilizers that have limited properties and applicability, if their present high cost which hurts their use to experimental work or exceptional situations could be substantially reduced. But another important field may open up in the building industry. The stabilizers traditionally used for monolithic or block earth construction have been cement and bitumen emulsions. Each of these has its limitations with regard to moisture resistance, structural strength, and other properties. There is great scope for new stabilizers here, and the synthetic resins seem to have promising potentialities, subject to the above qualifications. Of course, allied to the chemical and engineering research on finding suitable stabilizers, some imaginative research on the architectural possibilities of earth construction is required. It may thus be possible to find new ways of producing earth structures in which far less soil is required and, hence, less stabilizer, which is in direct proportion to the amount of soil. This may mean that some synthetics would become economical within a much shorter space of time than is at present envisaged.

My special thanks are due to Prof. T. W. Lambe and Dr. G. E. Murray, who have carried out much of the work described in the latter part of this paper, and who have given valuable help and criticism in its compilation.

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(*To page* 254)

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Measurement of Plasticizer Absorption Rate of POLYVINYL CHLORIDE

by A. W. M. COAKER* and M. W. WILLIAMS†

A factor of basic importance in the PVC dry-blending process is the time required for plasticizer absorption, which determines the minimum dry-blending cycle. The Monsanto plasticizer absorption time test, using small quantities of material and inexpensive equipment, gives a quantitative measurement of the time required for plasticizer absorption under given conditions. The design of the apparatus, test precision obtainable, and several applications of the test are described.

DRY-BLEND mixing of polyvinyl chloride formulations for extrusion and injection molding is a compounding technique that within a few years has come into widespread use by manufacturers of vinyl products. The economy and simplicity of dry blending have made it possible for the compounding operation to be integrated, as it logically should be, with the extrusion or molding process. Further, the manufacturer who prepares his own vinyl dry blends reaps the benefits of economy and efficiency in materials handling and greater uniformity in the finished product.

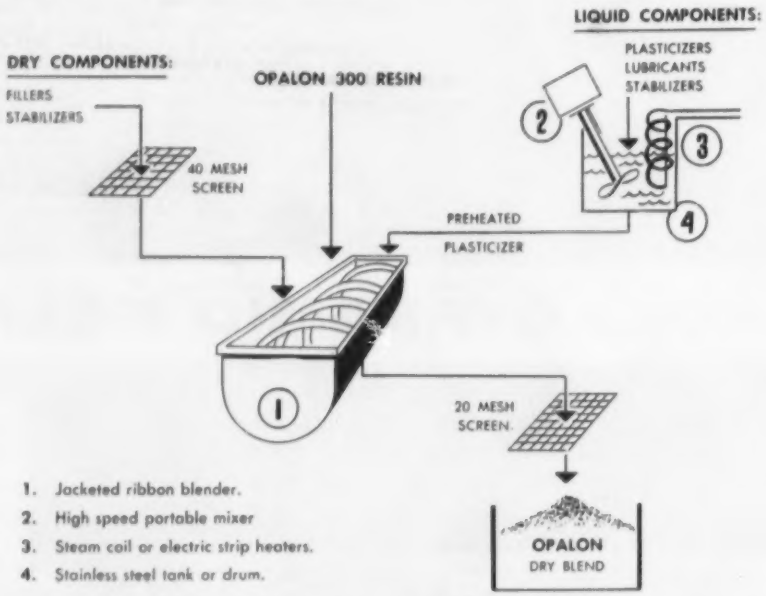
In a dry blend, the individual ingredients are uniformly dispersed and the liquid plasticizer completely absorbed by the resin. The normal dry blend is dry and sandy in appearance and feeds evenly and flows readily in the hopper of an extrusion or injection molding machine. It can be readily handled by conventional conveying equipment.

The blending process involves two distinct types of mixing: 1) the absorption of plasticizer by the PVC resin; 2) physical mixing of very small particles of PVC resin, filler materials (solid), stabilizers, and pigments.

Dispersion of individual ingredients is primarily a function of the mechanical design of the mixer, but the absorption of plasticizer is a more complicated matter. It depends on several variables, including time, temperature, type and amount of plasticizer, and rate of agitation. Since the length of time required for absorption of plasticizer is appreciably lessened as the temperature is increased, the basic equipment requirement for dry blending is a mixer that will provide both heat and a suitable amount of agitation for adequate physical mixing of the product. A typical dry-blending process is shown schematically in Fig. 1.

A basic factor in the effectiveness of the process is the time required for plasticizer absorption. It is this factor that will determine the minimum dry-blending cycle. A laboratory test method that could be used to determine the plasticizer absorption time with good precision, while using only small quantities of material and inexpensive equipment, would be, of course, a valuable tool in dry blending. The test could be used to evaluate the dry-blending characteristics of varying amounts or types of plasticizers, and the results correlated with the performance of individual dry-blend processes.

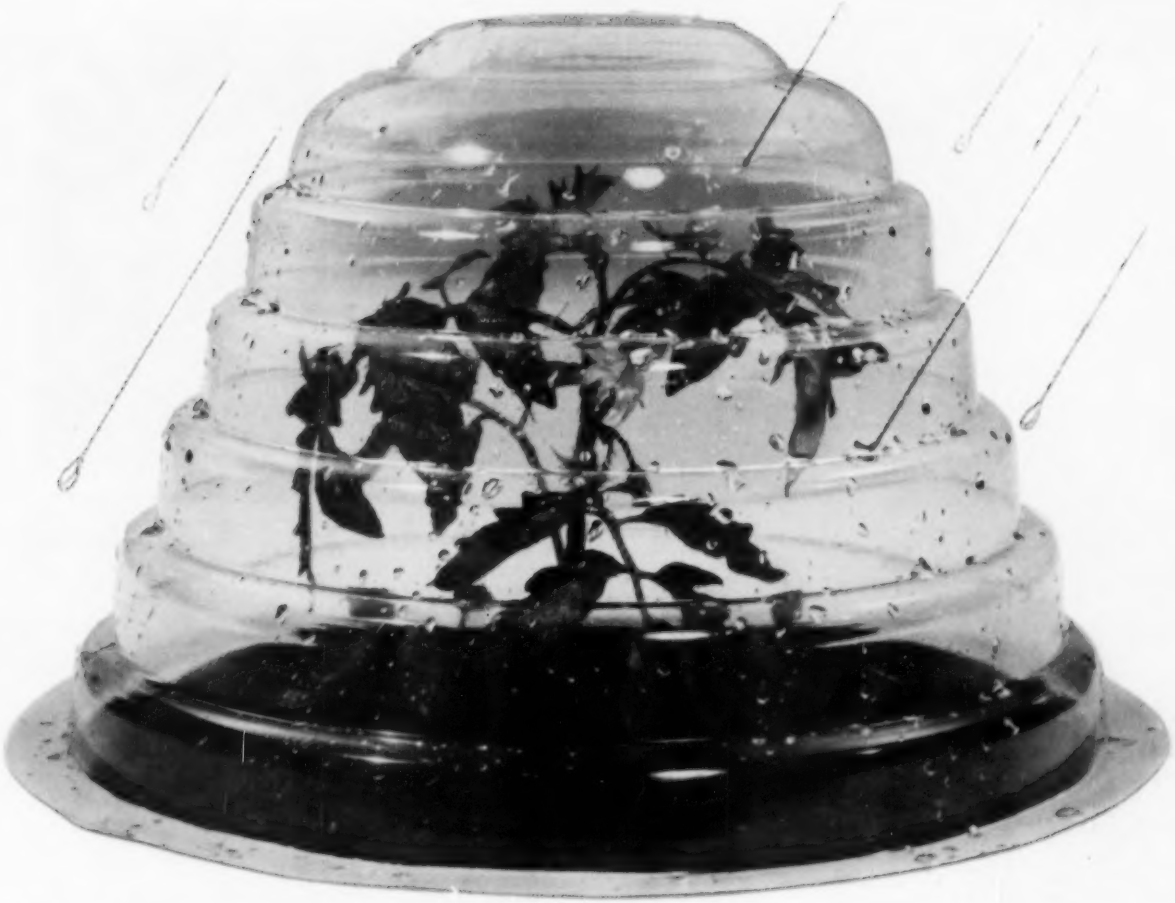
Since a simple quantitative method of measuring the plasticizer absorption time has not been presented in the literature, the Mon-



1. Jacketed ribbon blender.
2. High speed portable mixer
3. Steam coil or electric strip heaters.
4. Stainless steel tank or drum.

Fig. 1—Schematic diagram of typical dry-blending process

* Research Dept., † Technical Service, Plastics Div., Monsanto Chemical Co.



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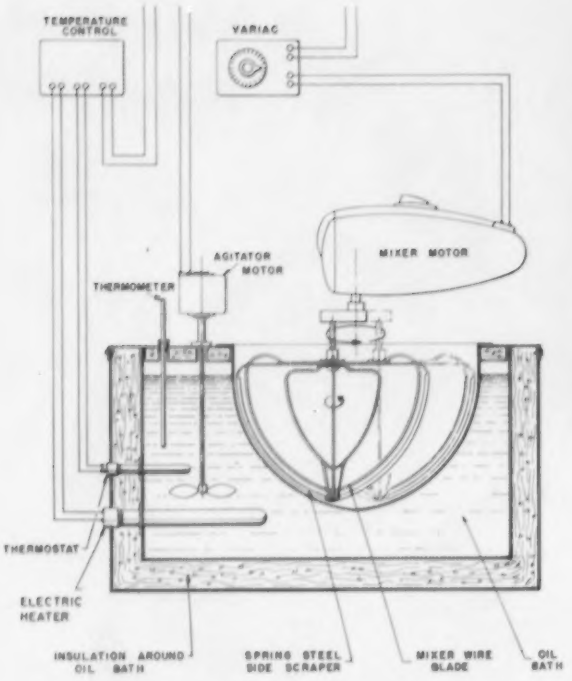

Fig. 2—Diagram of apparatus for plasticizer absorption time test; centering of mixer shaft is important

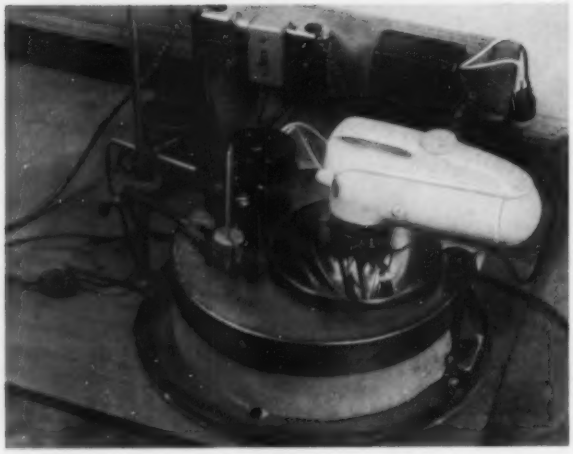

Fig. 3—Photograph of equipment set-up for plasticizer absorption time test. Stainless steel bowl is partially submerged in thermostatically controlled heated oil bath

santo plasticizer absorption time test may be of interest to the many dry-blend processors. This test was developed under the direction of Dr. D. V. Collins with the assistance of A. L. Higgins and D. G. Richter, both of whom worked out basic design problems.

Apparatus

The apparatus necessary to conduct the plasticizer absorption time test can be described most simply as a planetary-motion paddle mixer operating in an externally heated container (see Figs. 2 and 3). A stainless steel (or glass) bowl is supported, partially submerged, in a thermostatically controlled, heated oil bath. For routine testing purposes, where adjustment over a temperature range is not required, a boiling water bath is satisfactory. Centering of the mixer shaft, with respect to the bowl is important. Spring steel scrapers brazed onto the paddles are desirable to eliminate wall build-up. A stop watch is used for timing. Blueprints of the equipment are available.

Test Method

With the apparatus at operating temperature, a suitable charge (e.g., 100 g.) of resin at room temperature is placed in the bowl. A suitable charge (40 to 100 g.) of plasticizer, also at room temperature, is added and the mixer started.

The end point coincides with the time at which a small sample shows no plasticizer stain when subjected to pressure between two pieces of absorbent paper for a period of 1 minute. Alternatively, a small sample may be withdrawn on a steel spatula and pressed heavily on a flat surface; a plasticizer mark will be observed on the spatula if the point of "dryness" (end point) has not been reached.

The plasticizer absorption time, or time to "dryness," is the time, as measured by a stop watch, from the point of plasticizer addition to the end point as determined above. The results for a given set of test conditions are expressed in minutes and seconds, e.g., 3:30.

Standard plasticizer absorption time refers to designated standard conditions of 100 g. of resin, 50 g. of DOP plasticizer, at 100° C. bath temperature, with a stirring rate of 70 r.p.m.

Reproducibility of Test

From an analysis of plasticizer absorption time results in a statistically designed experiment in which individual determinations under standard conditions were run in triplicate, it was calculated that the 95% confidence limits for an individual determination were ±10.6 seconds. This represents a precision of measurement that falls in the order of ±4 percent.

Applications

The test may be used for a variety of purposes. Some examples are as follows:

1. As a control test for the plasticizer absorption characteristics of PVC resins. The standard plasticizer absorption times of two PVC resins were found to be: Resin A—3:45; Resin B—5:30.

The two resins were then compared in actual dry-blending performance in a 1-gal. Reed mixer, jacketed for hot circulating water. A 3000-g. batch of the formulation given below was mixed in the apparatus described, with a jacket temperature of 225° F.

Resin	100 parts
DOP	42 parts
Secondary plasticizer	23 parts
Dry ingredients (fillers and lead stabilizers)	43 parts

All the formula ingredients were charged together to the hot blender, the mixer started, and the time to dryness measured. The superior performance of Resin A, as would be expected from the plasticizer ab-

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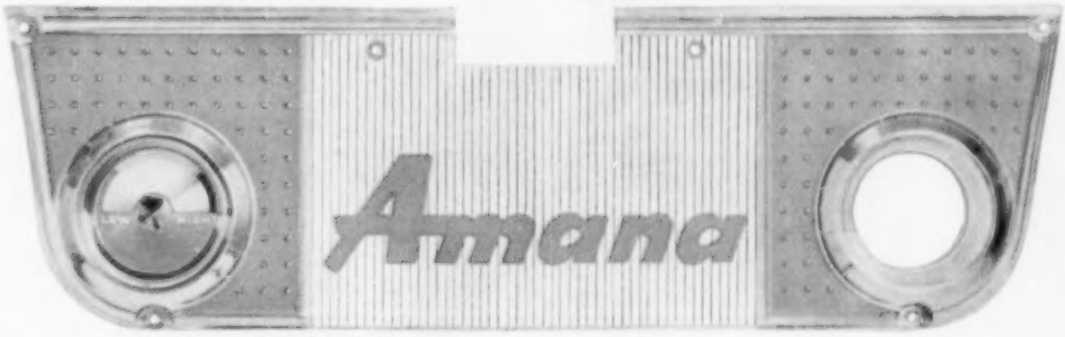

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sorption time data, was demonstrated by the results obtained:

	Resin A	*Resin B*
Mixing time (to dryness)	7:00	13:30
Batch temp., °C. (at end point)	82°	103°

2. The test can be used to measure the effect of changes in plasticizer concentration on dry blending characteristics. Figure 4 shows the increase in plasticizer absorption time with an increase in plasticizer concentration from 50 to 100 p.h.r.

3. It can be used to measure the effect of different plasticizers on dry blending characteristics (Fig. 5).

4. It can be used to study the effect of mixtures of plasticizers on dry blending characteristics (Fig. 6).

5. The test may be used to study the effect of different blending temperatures by suitable variation of the bath temperature over the desired test range (Fig. 7).

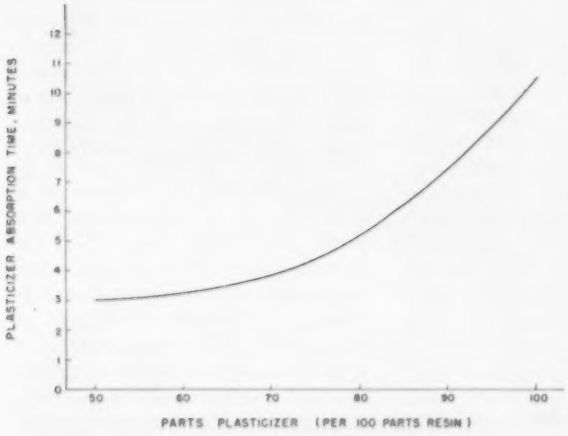

Fig. 4 — Plasticizer absorption time of Opalon 300-FM, plotted against increasing DOP plasticizer concentration

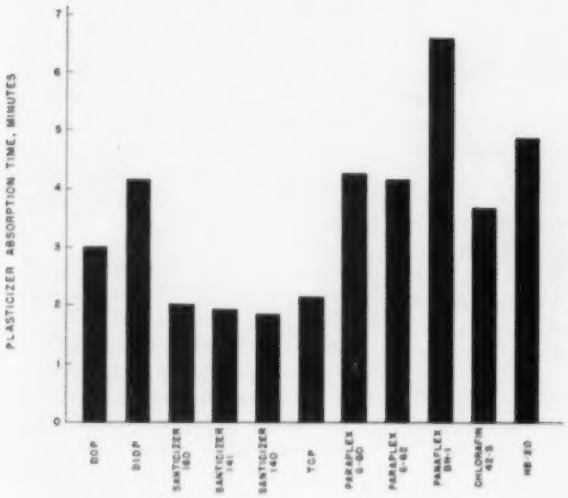

Fig. 5 — Plasticizer absorption time of Opalon 300-FM with 50 p.h.r. of a variety of plasticizers

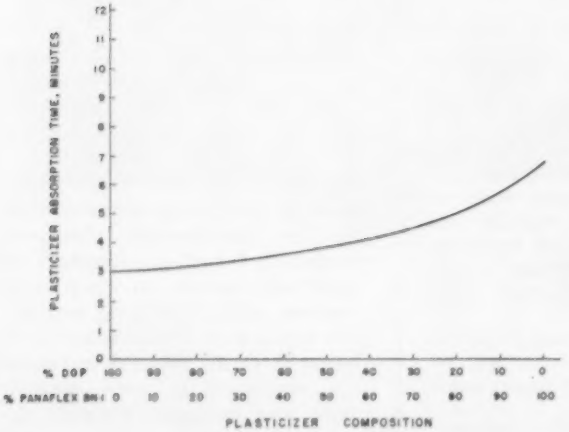

Fig. 6 — Plasticizer absorption time of Opalon 300-FM with 50 p.h.r. of plasticizer composition made up of different percentages of DOP and Panaflex BN-1

Supplementary Tests

Some supplementary tests that may be used to measure other aspects of the dry-blend process are:

1. *Angle of repose of the dry blend.*—This is an indication of the behavior of the dry blend in the hopper of an extrusion or injection molding machine, where regular and even flow of the material is necessary or the machine may be "starved." For example, a dry blend, in which the plasticizer has not been completely absorbed, may be slightly damp, and would have a high angle of repose, indicating poor hopper flow. A longer blending cycle, or a higher blending temperature might correct this condition.

2. *Screening of the dry blend.*—The proportion of agglomerates retained on a 20- or 30-mesh screen is an indication of the blending efficiency. Any large amount of these agglomerates is undesirable, since they may tend to clog extruder screens and reduce output.

3. *Extrusion performance of the dry blend.*—Both the rate of extrusion and the quality of the extruded product can be affected by changes in the blending conditions. Accordingly, after the minimum dry-blend cycle has been established, with the help of the plasticizer absorption time test, variations in the blending procedure on the order of addition of ingredients, preheating of plasticizer, etc., may be investigated to determine which procedure gives optimum extrusion performance.

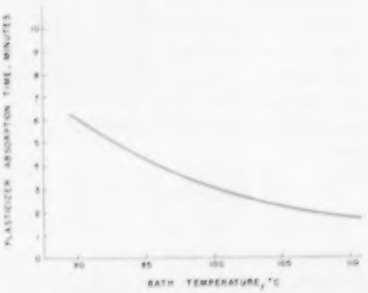

Fig. 7—Plasticizer absorption time of Opalon 300-FM vs. bath temperature

PLASTICS DIGEST*

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General

REFLECTIONS ON RUBBER RESEARCH. G. S. Whitby. Ind. Eng. Chem. *47*, 806-20 (Apr. 1955). Developments in the science of rubbers are reviewed. Since the introduction of synthetic rubbers, the subject of rubber has entered into the main stream of chemistry in a way and to an extent that did not prevail before, when the raw rubber used by industry was restricted to the natural product. Rubber as a field of research is now an integral and substantial part of the new realm of polymer science. The biogenesis of rubber is discussed; it is concluded that an understanding, when attained, of the way in which plants synthesize rubber is unlikely to point the way to a practical manufacturing process for the production of synthetic cis-polyisoprene. Attention is drawn to the meagerness of our knowledge of the chemical constitution of the natural antioxidant of Hevea rubber. The desirability of studying variation among Hevea trees in respect to the quality of the latex and rubber is suggested. New types of polymerization discussed with reference to their significance in the development of new and improved elastomers are popcorn polymerization, graft polymerization, and block polymerization. The preparation of graft synthetic elastomers is described. It is shown, by fractional precipitation and otherwise, that, when methyl methacrylate is polymerized in the presence of polybutadiene or poly(butadiene-styrene), branches of polymethyl methacrylate become grafted onto the stock polymer. The grafts have a marked reinforcing effect.

Materials

TERPENE - DERIVED PLASTICIZERS. PREPARATION OF PINIC ACID AND ITS ESTERS. V. M. Loeblich, F. C. Magne, and R. R. Mod. Ind Eng. Chem. *47*, 855-63 (Apr. 1955). Esters of some of the acids obtainable by stepwise oxidation of α-pinene—namely, pinic, *sym*-homopinic, and β-(hydroxyisopropyl)pimelic acid γ-lactone—were studied for their plasticizing characteristics. The results indicate that these esters are satisfactory and frequently excellent plasticizers for polyvinyl chloride acetate copolymer. Although they are somewhat less compatible and not quite so effective with polyvinyl chloride, in most respects their performance as plasticizers is adequate. Vinyl plasticizers that result in compounds exhibiting moduli and low temperature characteristics that rival those of compounds made with sebacates can be produced from terpene-derived acids. The cyclic structure of these substances does not necessarily inhibit adequate low temperature plasticization.

PLASTICIZATION OF POLYVINYL CHLORIDE WITH ALKYL ESTERS OF PINIC ACID. R. F. Conyne and E. A. Yehle. Ind. Eng. Chem. *47*, 853-55 (Apr. 1955). The permanence, stability, and low temperature properties of the *n*-octyl, octyldecyl, and 2-ethylhexyl diesters of pinic acid make these esters useful secondary plasticizers for polyvinyl chloride. Pinic acid diesters derived from lower alcohols are excessively volatile while the di-*n*-decyl ester is for most applications inadequately compatible as a secondary plasticizer.

ISOCYANATE POLYMERS STEP AHEAD. Chem. Eng. News *33*, 2688-90 (June 27, 1955). Facilities for the production of isocyanate chemicals and polymers are reviewed. Synthesis of isocyanates, types of polymers, and applications are also considered.

ALKYL AMATES AS PLASTICIZERS OF ELASTOMERS. A. W. Campbell. Ind. Eng. Chem. *47*, 1213-16 (June 1955). The usefulness of amide-type compounds as plasticizers of elastomeric substances is extended in this work on the amates. The compounds as a class are relatively unknown despite the fact that they possess the functions of both ester and amide. The substituted amates are stable liquids readily miscible in most of the elastomers. Natural rubber, GR-S, butadiene-acrylonitrile rubber, and polyvinyl chloride polymers were satisfactorily plasticized with these compounds. The eventual usefulness of these compounds is dependent upon the future economics of the substituted amines.

NEW MECHANICALLY-BONDED FIBROUS GLASS MAT. L. M. Calhoun. Materials & Methods *41*, 106-108 (Mar. 1955). Three types of new mechanically bonded fibrous glass mat reinforcing materials are described. They are made of sized glass fibers chopped and needled into a thin carrier mat, into unidirectional rovings, or into woven glass fabric; these three types fit almost all current molding requirements. Since mechanically bonded mats contain no chemical binder, problems of compatibility with the subsequent molding resin are avoided, and the good wetting and bonding characteristics of the mat permit higher glass-to-resin proportions with minimum sacrifice in strength. Improved drapability is another advantage; the mats will conform to sharp mold contours without bridging, and will not spring back from concave mold contours. Costly preform operations are eliminated in many applications. Also, because of the mat's pli-

INDEX, VOL. 32

The yearly index of *Modern Plastics* Magazine is now ready for distribution. It covers Vol. 32, September 1954 through August 1955. This 16-page index includes a General Index of Titles, a special title index of the Plastics Engineering and Technical Sections, a thoroughly cross-referenced index of Individual Subjects, and a complete Index of Authors. Copies will be sent without charge upon request to *Modern Plastics* Readers Service, 575 Madison Ave., New York, N.Y.

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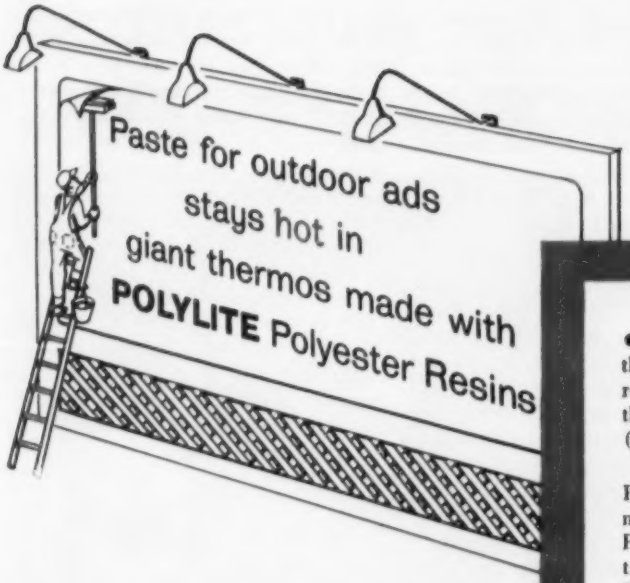

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ability even in heavy weights, one thick layer will replace multiple layers of chemically bonded mat, eliminating multiple cutting and lay-up steps.

Molding and Fabricating

GRANULATION OF POLYETHYLENE. A. Kennaway. Brit. Plastics *28*, 18-19 (Jan. 1955). A new method for producing polyethylene granules is described. This method consists of extruding laces and cutting them while still molten. Uniform spheroids are thus formed. These granules are much more free flowing than the older type of cube-cut granules, have a higher packing density, are entirely free from dust and longs, and because of uniformity of shape melt more evenly. Among the advantages found in molding experiments are a slightly higher output from extruders, superior surface finish of extruded articles, and steadier operation of machinery.

A NEW DEEP DRAWING MACHINE FOR THERMOPLASTIC FILM. H. Behringer. Kunststoffe *45*, 178-79 (May 1955). Thermoplastic film is deep drawn into cheap, mass-produced boxes or cans by a new apparatus, called Ufix. The Ufix method is in contrast to vacuum forming of thermoplastic sheet which involves a deformation process. This new method is similar to the forming of tin sheets. The plastic film is formed by drawing and compression between the plunger and the female mold without being stretched. It is therefore possible to print or decorate the bottom of the box or can prior to forming. All shapes obtainable from iron sheet can be deep drawn by the Ufix method. The thin-walled containers are remarkably strong and of uniform thickness. Packaging containers of rigid or plasticized polyvinyl chloride, copolymers, cellulose acetate, and polystyrene have been manufactured by the Ufix method. The capacity of the machine is 800 small or 600 larger containers per hour.

Applications

THE RUSH TO FORMED PLASTICS. Modern Packaging *28*, 79-85, 196, 198 (Mar. 1955). Vacuum forming has helped channel the rigid plastic package into low-cost, self-service merchandising. Highlights in the field of formed plastics packaging are: new variations in package forms, new techniques in attaching bubbles or domes to cards, new ideas in platforms and separators, new production techniques, new freedom in choice of materials, new success of formed-plastics packages in various product fields, and new achievements in package design. Numerous examples illustrating these highlights are given.

EPOXY-RESIN SYSTEM FOR EMBEDDED CIRCUITS AND COMPONENTS. A. E. Javitz. Elec. Mfg. *55*, 74-87 (Apr. 1955). The applications of epoxy resins to the field of circuit and component embedment, encapsulation, and impregnation are comprehensively reviewed. The properties of unmodified and modified epoxy resins are detailed, their advantages and limitations are discussed, and design factors are considered. Eight case histories are described in detail to illustrate the range of applications of epoxy resins and to show how special epoxy compounds are developed and applied to meet specific design requirements.

PLASTIC INDUSTRIAL CONTAINERS. C. E. Pruett. Ind. Eng. Chem. *47*, 1196-98 (June 1955). Although the plastic industrial container is a relative newcomer to the packaging field, the plastic carboy and the plastic drum are becoming increasingly important. They combine chemical resistance, flexibility, toughness, and lower tare weight than comparable glass or steel vessels. Most plastic containers have been made of polyethylene, but work on other materials is under way.

PLASTIC PIPE—OVER THE HUMP. Chem. Eng. News *33*, 3062-64 (July 25, 1955). The production of plastic pipe has increased from 5 million lb. in 1950 to an estimated 30 million lb. in 1955. A comparison chart shows that various types of plastic pipe compare favorably with cast iron pipe on an over-all basis. The types of plastic pipe, production figures, and properties are reviewed.

POLYSULFIDE LIQUID POLYMER SEALERS. W. J. Snoddon and J. C. Middleton. Product Eng. *26*, 129-32 (Mar. 1955). Sealing materials for joints must fill seams and voids and be resistant to corrosive attack. Polysulfide liquid polymer sealers are well suited for rugged service applications because of their ability to resist oxidative attack, aircraft fuels, most organic solvents, oils, and water, and because of a temperature flexibility superior to other sealers possessing equivalent solvent resistance. Although applied in a liquid state, they cure and harden in place without being damaged when the parts are removed for maintenance or inspection. Their flexibility permits their use under conditions of expansion, contraction, and torsion. Applications include pressure seals for airframes, gasket seals, smooth skins for aircraft, tough electrical sealers, and the sealing of wood deck and seams in marine applications.

Properties

USE OF THE REPEATED HYSTERESIS LOOP FOR EVALUATING REINFORCED PLASTICS. G. W. Bainton, Jr. Plastics Tech. *1*, 290-94 (June 1955). The magnitude of the resin-glass interface placed in shear varies with different sample constructions and controls and behavior of the samples under repeated stress. Hysteresis energy loss provides a means of measuring the effect of stress at the resin-glass interface. With repeated stress cycles, measurement of hysteresis loss provides a means of following the changes occurring at this interface. Flexural modulus indicates the degree to which the glass fibers take stress in tension and compression. With repeated stress cycles, changes in flexural modulus indicate changes in the ability of the glass to take load. Analysis of hysteresis loss, combined with an analysis of flexural modulus during repeated stress cycling at increasing loads, provides an effective method of comparing different constructions of reinforced plastics and the effects of conditions likely to be encountered in service. It is stated that such data are far more helpful in determining safe working limits for structural plastics than standard physical tests.

REPORT ON MOLECULAR-WEIGHT MEASUREMENTS OF STANDARD POLYSTYRENE SAMPLES. II. INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY. H. P. Frank and H. F. Mark. J. Polymer Sci. *17*, 1-20 (May 1955). One more polystyrene fraction was investigated in numerous laboratories by means of viscosimetry, osmometry, light scattering, and ultracentrifuge. The various results

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are compared and critically discussed. Possible explanations and suggestions for improvement are offered in those cases in which considerable discrepancies occur. The viscosity results show satisfactory agreement. The discrepancies among osmotic results are believed to be due largely to unsatisfactory performance of the so-called semipermeable membranes. Discrepancies among light-scattering results can mostly be traced back to the unsatisfactory state of the various calibration techniques. The results obtained with the ultracentrifuge agree quite satisfactorily.

IMPACT OF HIGH-ENERGY RADIATION ON DIELECTRICS. A. E. Javitz. Elec. Mfg. *55*, 85-104 (June 1955). The effects of the impact of high-energy radiation are comprehensively discussed. Not all the effects of high-energy radiation are degradative. The dielectric and insulating characteristics of certain polymers are actually improved by intense radiation. Radiation effects and radiation resistance are of primary design concern, however, in applications of dielectrics in the electrical apparatus, machines, and instrumentation to be used in nuclear-powered power plants, or where electrically energized equipment must move within radiation areas in plants handling fissionable products, or in instrumentation applications such as radioactive batteries, ionization chambers, nuclear research instruments, electromedical equipment employing radioactive isotopes, etc. In many such applications, the radiation shielding necessary to protect the human operator also protects the insulation. Types of radiation include fast neutrons, gamma radiation, thermal neutrons, fission products, beta radiation, protons, deuterons and alpha particles, and electrons and X-rays. Sources of these types of radiation and the mechanism whereby they cause damage to organic materials are discussed. Some basic radiation definitions are given. Graphs are presented to show the dielectric breakdown of polyvinyl formal insulation under various radiation exposures, the evolution of gas from silicone-resin insulation under cobalt-60 irradiation, the tensile and impact strength of polyester and phenolic resins as a function of pile radiation, the conductivity of dielectric polymers during gamma irradiation, the recovery of dielectric materials after irradiation, the variation of conductivity with dosage rate, the shear strength and tensile strength of silicone-glass laminates and tape, and the tensile strength and elongation of Mylar polyester film under irradiation. The results of outstanding evaluative reports dealing with the changes in character of plastics under the influence of irradiation are summarized.

Testing

HARDNESS TESTER FOR PLASTICS. Brit. Plastics *28*, 110 (Mar. 1955.) A new hardness tester for plastics is described that provides an extremely accurate means of measuring indentation, compression, or bending caused by a known load. The instrument operates on the null reading principle, the null position of the indentor being indicated by an electronic circuit and earphone. By selecting suitable test conditions, in-

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dentation tests can be carried out on films 1 mil thick. Tests can also be carried out on rigid plastics and readings have been found to be surprisingly consistent and sensitive. The instrument may be suitable for carrying out tests for state of cure of fibrous glass-reinforced laminates and for studying creep behavior of plastics materials.

NEW APPARATUS FOR MEASURING THE FLOW OF THERMOSETTING POWDERS AND MOLDING COMPOUNDS. C. M. von Meysenbug. Kunststoffe 45, 48-52 (Feb. 1955). ASTM Method D 731 for Measuring the Molding Index of Thermosetting Molding Powder is also an accepted German standard (DIN 53465). It is comparatively expensive, determines only one point, and can be used only for powders. Based on ASTM D 569, Measuring the Flow Properties of Thermoplastic Molding Materials, a new apparatus was developed which is capable of measuring the flow properties of thermosetting powders and after some modifications also those of thermosetting compounds containing fillers. Since the testing of both kinds of materials is done under identical conditions, a direct comparison of the behavior of molding compounds with and without the use of fillers is possible.

Chemistry

PREPARATION AND CHARACTERIZATION OF BLOCK COPOLYMERS. A. E. Woodward and G. Smets. J. Polymer Sci. *17*, 51-64 (May 1955). Block copolymers were synthesized by heating a polymer, containing peroxidic linkages, in the presence of another monomer. The peroxide groups were introduced into the first polymer by initiating the controlled polymerization of its monomer with phthalyl peroxide. Separation of the block copolymers from the two parent homopolymers was made possible by their different solubilities in selected solvents or their mixtures. Polystyrene ($M_n = 1.00 \times 10^5$), prepared at 75° C. in bulk with 0.5% phthalyl peroxide, initiated the polymerization of methyl methacrylate at 100° C. in benzene solution. The two block copolymer components isolated were found by infra-red analysis to contain 22 and 30% polystyrene with number average molecular weights of 4.3×10^5 and 3.0×10^5, respectively. Block copolymers were also

obtained by heating styrene in benzene at 85° C. with polyvinyl acetate ($M_n = 0.60 \times 10^5$), prepared in benzene solution at 70° C. with 0.5% peroxide. A 30% vinyl acetate-61% styrene block copolymer was isolated and found to have a molecular weight of 1.65×10^5. Intrinsic viscosities, μ values, and k' values for the block copolymers and related homopolymers were determined and are discussed in terms of composition, molecular weight, and polydispersity. Other experiments indicated that styrene-phthalyl peroxide polymers were unable to initiate vinyl acetate or vinylpyrrolidone polymerizations at 100° C. in significant amounts; this behavior is interpreted in terms of the stability of the radicals formed.

CHEMISTRY AND TECHNOLOGY OF UREA RESINS. I. ASSOCIATION THEORY OF UREA RESIN FORMATION. H. Fahrenhorst. Kunststoffe 45, 43-48 (Feb. 1955). Neither the methyl group in its classical form nor the methylene bond in urea radicals play an important role in the mechanism of the formation of urea resins. This mechanism is determined by the capacity of relatively low-molecular-weight compounds to associate with each other, which is a characteristic property of the amino resins, and also by the simultaneous formation of solvent molecules. This two-way capacity to associate is based on the characteristic capacity of primary urea-formaldehyde addition products to eliminate intramolecular water and to form intermediary azomethine groups. The occurrence of the latter is deduced from experimental data. The mechanism of the formation of urea-formaldehyde resin is neither a true polymerization nor a true polycondensation process. It is interpreted on the basis of the electron theory.

Publishers' Addresses

British Plastics: Iliffe and Sons, Ltd., Dorset House, Stamford St., London S. E. 1, England.
Chemical and Engineering News: American Chemical Society, 1115 Sixteenth St., N. W., Washington, D. C.
Electrical Manufacturing: The Gage Publishing Co., 1250 Sixth Ave., New York, N. Y.
Industrial and Engineering Chemistry: American Chemical Society, 1115 Sixteenth St., N. W., Washington 6, D. C.
Journal of Polymer Science: Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y.
Kunststoffe: Karl Hanser Verlag, Leonhard-Eck-Strasse 7, Munich 27, Germany.
Materials and Methods: Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y.
Modern Packaging: Modern Packaging Corp., 575 Madison Ave., New York 22, N. Y.
Plastics Technology: Bill Brothers Publishing Corp., 386 Fourth Ave., New York 16, N. Y.
Product Engineering: McGraw-Hill Publishing Co., 330 W. 42nd St., New York 18, N. Y.

U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

POLYMER MIXTURES. M. M. Safford and A. M. Bueche (to General Electric). U. S. 2,710,290, June 7. Organopolysiloxane - polytetrafluoroethylene mixtures.

TRIM. J. L. Yates. U. S. 2,710,333, June 7. Illuminated plastic trim for motor vehicles.

FILMS. N. J. Platzer and F. A. Carlson, Jr. (to Monsanto). U. S. 2,710,426, June 14. Casting vinyl films.

MOLDING COMPOSITIONS. G. C. DeCroes and J. W. Tamblyn (to Eastman Kodak). U. S. 2,710,811, June 14. Cellulose acetate butyrate compositions.

LAMINATES. E. H. Hilborn and C. F. Smith (to Eastman Kodak). U. S. 2,710,820, June 14. Formation of laminates using contact resins.

ADHESIVE. W. K. Fischer (to U. S. Rubber). U. S. 2,710,821, June 14. Adhesive for bonding polyperfluorovinyl chloride to metal.

CELLULOSE DERIVATIVES. M. S. Thompson (to Hercules). U. S. 2,710,844-5, June 14. Cellulose derivatives stabilized with epoxy condensates.

POLYMERS. M. A. Dietrich and A. F. Smith (to Du Pont). U. S. 2,710,846, June 14. Compositions of acrylonitrile.

ACRYLONITRILE. G. E. Ham (to Chemstrand). U. S. 2,710,847, June 14. Acrylonitrile polymer dissolved in dimethyl methanephosphonate.

SOLUTION. S. S. Sweet, M. H. Van Horn, and P. T. Newsone (to Eastman Kodak). U. S. 2,710,848, June 14. Linear terephthalate polymers dissolved in trifluoroacetic acid.

RESINS. T. Boyd (to Monsanto). U. S. 2,710,850-1-2, June 14. Cyanoacetic acid ester resins.

POLYIMIDES. W. M. Edwards and I. M. Robinson (to Du Pont). U. S. 2,710,853, June 14. Polyimides of pyromellitic acid.

POLYMERIZATION. H. S. Seelig (to Standard Oil). U. S. 2,710,854, June 14. Ethylene polymerization.

TALL OIL. J. E. Carpenter (to American Cyanamid). U. S. 2,710,-856, June 14. Condensates of tall oil with polyalkylene polyamines.

CONTAINERS. R. F. Gray (to Injection Molding). U. S. 2,710,986, June 21. Applying inserts to plastic containers.

LAMINATES. O. B. Sherman (to Owens-Illinois). U. S. 2,710,987, June 21. Laminated plastic articles.

MOLDING. T. N. Willcox, R. L. Borchert, and G. N. Harris (to General Electric). U. S. 2,710,988, June 21. Molding machine.

MOLDING. R. L. Halstead and L. V. Whipple (to R. P. Scherer). U. S. 2,710,990, June 21. Molding die.

PLASTIC ARTICLES. A. T. B. P. Squires and C. G. Hannah (to Rolls Royce). U. S. 2,710,991, June 21. Molded polytetrafluoroethylene.

ABRASIVES. J. E. Price and K. D. Groves (to American Viscose). U. S. 2,711,365, June 21. Resin-bonded abrasive articles.

LAMINATE. M. H. Pintell (to Reynolds Metals). U. S. 2,711,380, June 21. Metal-resin laminate.

RESIN. S. A. Harrison and W. F. Brown (to B. F. Goodrich). U. S. 2,711,400, June 21. Mixtures of butadiene-styrene with vinyl chloride resin.

VINYL CHLORIDE. Stabilized chlorine-containing vinyl resins.

POLYESTERS. N. Fletcher (to Imperial Chemical). U. S. 2,711,402, June 21. Aluminates as ester exchange catalysts in making polyesters.

RELIEF MAPS. L. G. Simjian (to Reflectone). U. S. 2,711,606, June 28. Relief maps from deformable plastic sheet.

SHEET JOINING. A. H. Carland (to General Mills). U. S. 2,711,779, June 28. Apparatus for cutting and welding thermoplastic sheet.

PLASTIC WELDING. R. I. Hakomaki (to General Mills). U. S. 2,711,780, June 28. Butt welding thermoplastic material.

HEAT-SEALING. N. Langer. U. S. 2,711,781, June 28. Machine for heat-sealing layers of thermoplastic sheet material.

FILTER. E. F. Webb and A. M. Hansen (to Chrysler). U. S. 2,711,828, June 28. Plastic fabric filter.

PAPER. W. M. Bruner (to Du Pont.) U. S. 2,711,961, June 28. Making paper incorporating urea resin.

ETHYL CELLULOSE. G. H. Pyle (to Hercules). U. S. 2,711,965, June 28. Removing color bodies from ethyl cellulose.

FABRIC TREATMENT. W. S. Miller and J. S. Schofield (to Calico Printers). U. S. 2,711,971, June 28. Fabric treated with methylol acetone resin precondensate.

COATINGS. W. T. Miller and A. D. Kirshenbaum (to United States). U. S. 2,711,972, June 28. Polyperfluorobutadiene coatings for application on metals.

TUBING. C. J. Straka (to Westinghouse). U. S. 2,711,982, June 28. Rolled phenolic resin-bonded paper tubing.

BONDING. M. W. Alson (to U. S. Rubber). U. S. 2,711,985, June 28. Bonding polyethylene to butyl rubber.

BONDING. D. E. Strain and T. H. Crim (to Du Pont). U. S. 2,711,986, June 28. Bonding rubber to chlorosulfonated polyethylene.

FILM. C. H. Hofrichter, Jr. (to Du Pont). U. S. 2,711,996, June 28. Vinylidene chloride copolymer film.

PLASTICIZERS. H. G. Trieschmann, W. Ender, L. Reuter, and W. Froese (to Badische Anilin). U. S. 2,711,-997, June 28, Bis-carbonic acid esters of glycols as polyvinyl chloride plasticizers.

FLAMEPROOFING. J. W. Weaver, J. G. Frick, Jr., and J. D. Reid (to United States). U. S. 2,711,998, June

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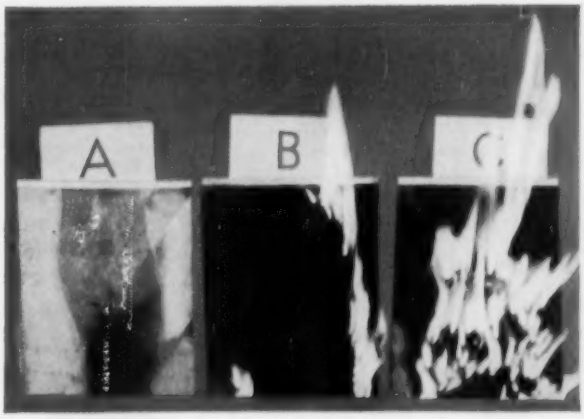

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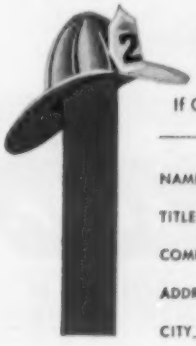

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28. Haloalkyl phosphate amino resins.

VINYL RESINS. J. D. Brandner and R. H. Hunter (to Atlas). U. S. 2,711,-999, June 28. Plasticized vinyl resins.

EPOXY RESINS. J. D. Zech and S. O. Greenlee (to Devoe and Raynolds). U. S. 2,712,000-1, June 28. Epoxy resins.

POLYMERS. A. H. Bowen (to Monsanto). U. S. 2,712,003, June 28. Water-soluble heteropolymers.

POLYMERS. W. M. Thomas (to American Cyanamid). U. S. 2,712,-004, June 28. Allyl melamine polymers.

STRING. J. T. Crandall, U. S. 2,712,-263, July 5. Multi-component thermoplastic strings.

LAMINATING. C. L. Claff, C. E. Claff, and C. A. Moeller (to M. B. Claff). U. S. 2,712,342, July 5. Laminating machine.

HEAT-SEALING. R. E. Stanton (to Celanese). U. S. 2,712,343, July 5. Heat-sealing machine.

SODIUM PACKAGE. E. R. Corneil (to Du Pont). U. S. 2,712,384, July 5. Metallic sodium enveloped with polyethylene.

COATING. P. J. Massey. U. S. 2,712,-508, July 5. Coating paper with high-melting plastics.

IDENTIFICATION PASS. J. M. English, Jr. (to United States). U. S. 2,712,514, July 5. Plastic badge.

POLYMERIC REACTION. M. M. Szwarc and A. N. Roper (to Petrocarbon). U. S. 2,712,532, July 5. Polymers of polymethyl benzenes.

SPHERES. F. H. Winslow (to Bell Telephone). U. S. 2,712,536, July 5. Production of polymer spheres.

POLYMERS. G. F. D'Alelio (to Koppers). U. S. 2,712,537, July 5. Polymerizates of pyrimidyl amides of beta-cyano-acrylic acids.

RESINS. F. G. Wadsworth (to Pan American Refining). U. S. 2,712,538, July 5. Resins from hydrocarbon pyrolysis products.

CONTAINERS. S. Bright, Jr. (to Troth Bright Page). U. S. 2,712,777, July 5. Folding plastic containers.

ABRASIVE BELT. W. H. Storrs and A. J. Weils (to Hartford Special Machinery). U. S. 2,712,987, July 5. Thermoplastic belt with abrasive.

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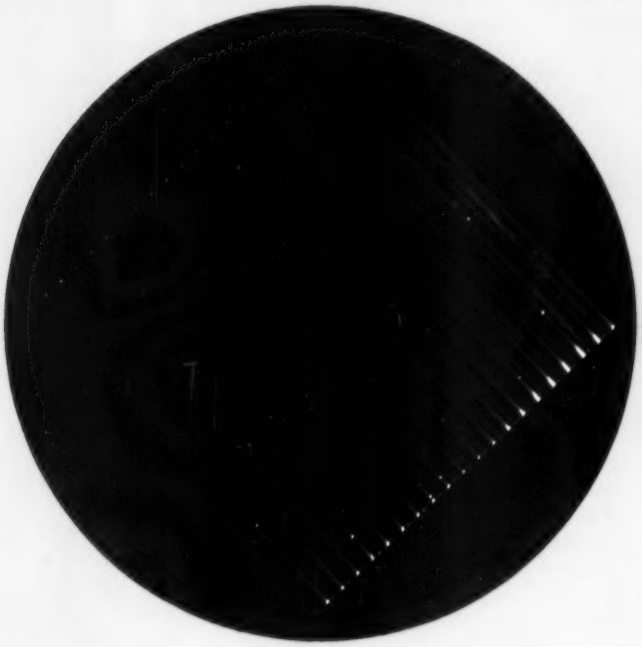

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Heat-Sealer—Designated Experdo LA 1500-N, this heat-sealing machine is a high-frequency welding unit with a power output of 1.5 kilowatts. Constant output, even after many hours of service, is claimed.

The machine incorporates an automatic unit production counter (0 to 10,000). Starter is of the foot pedal type. Ball bearings are used for all moving parts. Machine table dimensions are 16 by 30 in., overall size of the machine is 33½ by 35½ by 53⅛ inches.

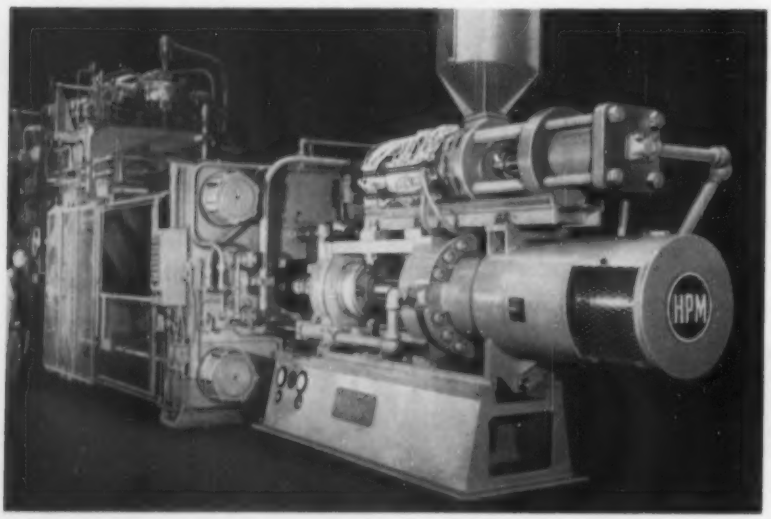
Produced in Holland by M. J. Podt, the Experdo is available in the United States through *Montan Export, Inc., 17 Battery Pl., New York 4, N. Y.*

Injection Machine—Claimed to be the largest plastics injection molding machine ever built, Model 3000-P-400 has 3000-ton clamping pressure and a maximum capacity of 400 oz. per shot. Dry run cycle is 22 seconds. Injection speed is 7200 cu. in./minute. The machine is equipped with a positive shot-measuring device and a preplasticizing chamber that automatically supplies material to the injection chamber upon retraction of the injection plunger. High-speed clamp closes the mold and develops full clamp pressure of 3000 tons in 6 seconds. Hydraulic ejectors on the stationary side of the die head are said to eliminate the use of pull chains when ejection is from the sprue side, and a built-in hydraulic mold elevator and positioner are said to reduce mold setting time. The hydraulic mold clamp is of double-acting design. The main ram is equipped with a small internal booster ram which closes the clamp platen to within a fraction of an inch of the total clamp stroke. At this predetermined position, hydraulic pressure is shifted to the large ram area. On the return stroke, clamp opening starts at slow speed to separate the mold, shifts to high speed, and then automatically slows down before actuating the hydraulic knockouts.

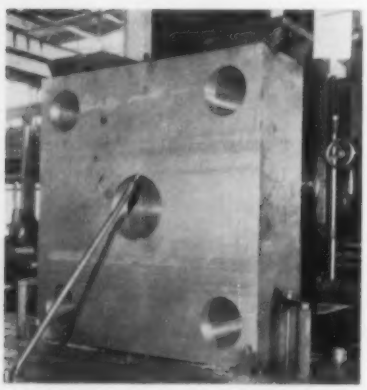
The hydraulic injection unit also consists of a double-acting ram. When the clamp closes, pressure on the nozzle sealing cylinder moves the injection chamber nozzle against the mold. An automatic injection pressure-compensating device permits the injection plunger to move forward at a constant speed and high pressure and, when a predetermined high pressure is reached, pressure is automatically reduced to a predetermined lower pressure.

Manual controls consist of switches

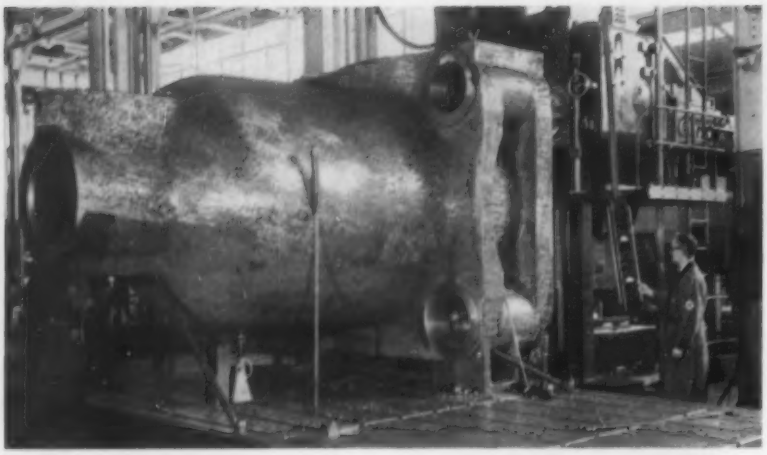
Clamping cylinder ram of Model 3000-P-400 has 50-in. diameter, is 113 in. long, and weighs 29,080 pounds



H-P-M's Model 3000-P-400 injection molding machine is reported to be the largest injection machine ever built; it has capacity of 400 oz. per shot



Die head of Model 3000-P-400 measures 88 in. wide by 88 in. long by 26 in. thick and weighs 63,770 pounds



Clamping cylinder of Model 3000-P-400 is 133 in. long, weighs 85,350 pounds

and push-buttons for starting and stopping the motor, turning heat on and off, cycle control, clamp control, and injection control. An emergency reverse button returns the clamp to the open position from any point.

Main operating valves are actuated by a pilot cylinder, and Microflex timers control clamp and injection actions. The operator must close the gate to start each cycle; opening the gate interrupts the cycle.

The material feed unit consists of a reciprocating plunger hydraulically operated which feeds the material into the heating chamber.

Two 110-gal. variable-delivery, high-pressure radial pumps generate the hydraulic pressure for injection. The same pumps traverse the clamp ram during mold opening and closing. A 30-gal./min. variable-delivery pressure pump provides the necessary mold clamp slow-downs for breakaway and for hydraulic ejection. This pump also generates the hydraulic pressure for holding the 3000-ton clamp during injection.

Plasticizing capacity of the machine is 600 lb. of styrene per hour. *The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.*

Winding Machines—Jay-type rewind has a double-bar center-wind take-up with a 1½-hp. Varidrive motor. The dual center wind can be supplied to take paper tubes, wooden shells, or both, and is outfitted with Morse Rockford clutches. The unit is also equipped with an examining board and a measuring drum with Veeder-Root counter, thus providing for tubing, measuring, and examining in one machine. The rewind equipment can be set in line with an unwind unit and a printing machine for complete production set-up.

Jay-type unwind machine consists of ball bearing let-off stand, pinch rollers for unwinding materials from rolls, jay box, and adjustable tension bar. Supplied with a ¾-hp. motor drive, the machine is a complete package unit; i.e., when bolted in line with a printing machine, it becomes an integral part of the machine, permitting continuous operation without loss of material because of stoppage. *Liberty Machine Co., Inc., 275 Fourth Ave., Paterson 4, N. J.*

Drum Tumblers—Two models have been added to a line of tumblers designed for dry color work in injection and extrusion plants. A 2-hp. heavy-duty model handles 300 lb. of plastics material, 150 lb. in each of two drums. A 3-hp. extra-heavy-duty tumbler is designed to handle full drums of powder (using a special clamp-on hood in place of the conventional drum lid to provide tumbling space). *Injection Molders Supply Co., 3514 Lee Rd., Cleveland 20, Ohio.*

Injection Molders Supply's extra-heavy-duty tumblers use clamp-on hoods to provide tumbling space

Paint-Wipe Machine—Model 7000 is a combination of a part-rotating spray-painting machine and an automatic paint wiper. It has six holding stations. Operation is as follows:

The first indexing of a part is to the painting station, where it is raised into a mask, rotated, and sprayed with a band of paint that covers all depressed letters, numbers, and the like. The part is then indexed to the wiping station, where it is again raised and spun against a towel that wipes it, removing all paint except that in indented areas. The towel is of the continuous-roll type and may be washed for re-use. Indexing is by Geneva action, powered by an explosionproof motor.

The machine is claimed to index up to 1800 pieces per hour. Allowing for time for mask cleaning, net production is between 900 and 1300 pieces per hour, depending on shape of part and frequency of mask cleaning. *Finish Engineering Co., Inc., Erie, Pa.*

Temperature Control—Model 6031 is a triple-temperature control unit designed for applications where three automatically controlled temperatures in the range between 60 and 240° F. are desired; it is particularly intended for use in calendering, injection molding, and vacuum forming operations. The equipment, said to be fast heating and fast reacting, has a low water capacity, high water velocity, and modulating cooling control. *Sterling, Inc., 3738 N. Holton St., Milwaukee 12, Wis.*

Hydraulic Press—Designed to conform with British Plastics Federation specifications, 200/50-ton compression and transfer press has provision for top and bottom mechanical ejection and hydraulic ejection by transfer cylinder with adjustable stroke stops. Fully interlocked guards, single-lever piston valve control, electrically heated platens, automatic time cycle control with slow closing arrangement and delay valve to provide breathing control, and tee slots on frame surrounding

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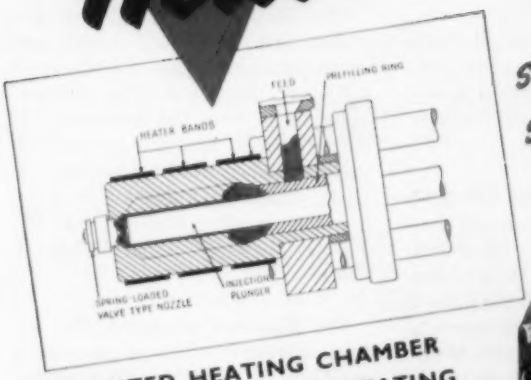

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gives new high plasticising rate and low uniform injection pressure

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DOWDING

Fully Automatic Fast-Cycling

INJECTION MOLDING MACHINE

SPECIFICATION

Approximate weight of material plasticised per hour (Dependent upon weight per shot and material used)	22 lb.
Area of injection plunger	2.074 sq. in.
Pressure per square inch on material at end of plunger	9,100 lb.
Total pressure on injection plunger	18,850 lb.
Mold opens (adjustable)	6—9 in.
Maximum die space	7½ in.
Minimum die space	3½ in.
Maximum recommended casting area in mold	15 sq. in.
Size of die plates	16 x 10 in.

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mold opening for attachment of accessories are provided.

Specifications are as follows: Main ram of 16-in. diameter gives 200 tons at 2240 p.s.i., or 250 tons at 2800 p.s.i. Daylight is 43½ in. between tables and 30 in. between platens. Stroke is 24 inches. Tables are 34 by 30 in., platens 30 by 30 inches. Transfer ram of 8-in. diameter gives 50 tons at 2240 p.s.i. or 62½ tons at 2800 p.s.i. Transfer plunger diameter is 3⅛ inches. *T. H. & J. Daniels Ltd., Stroud, Gloucestershire, England.*

Printing Machine — Two-color marking on printable polyethylene and styrene lids, caps, covers, etc., at production rates is made possible with Model 25AD2 printing machine. Operating speed is variable up to 45 imprints per minute.

Work-holding fixtures can be adapted to fit the work and a 12-station dial feed is synchronized with the printing head to assure proper registration. The equipment can be used in conjunction with automatic feed devices. Printing pressure is adjustable. *Markem Machine Co., Keene 21, N. H.*

Injection Machine—Model 300TA-12/16-oz. injection molding machine has a dry-cycle time of 10 seconds. Through multiple strokes, a built-in stuffing arrangement is said to make possible production runs on parts weighing 16 oz. or more. When operated fully automatically, a low-pressure die closing unit prevents damage to the mold in the event a molded piece fails to eject.

Three proportioning-type pyrometers provide three-zone temperature control for the Reed-Speed heating cylinder, which has a plasticizing capacity of 115 lb. per hour. Mold platens measure 29 by 32½ in.; space between tie bars is 15 by 20½ in.; and rated projected casting area is 150 sq. inches. Mold clamping stroke is adjustable between 7½ and 12½ inches.

Double-shear toggle develops 300 tons of mechanical mold clamping pressure.

The machine is equipped with various safety devices for the protection of both the machinery and operating personnel. *Reed-Prentice Corp., Worcester 4, Mass.*

Hydraulic Press—Model UA-4-10 hydraulic press is an up-acting machine made to meet J.I.C. standards. Size of platen is 20 by 14 in.; open daylight is 18 in., closed daylight 2 in.; maximum platen or ram travel is 16 in.; closing speed of platen is 157 in./min., return speed of platen is 331 in./min.; movement of platen is controlled by a 110-v. 60-cycle a.c. up-and-down push-button station.

Pressure range of the unit is from 1½ to 10 tons. Predetermined pressures may be set by adjustment of relief valves. A direct-reading pressure gage indicates tonnage exerted. *Greenerd Arbor Press Co., Nashua, N. H.*

Painting Machine—Automatic rotary spray-painting machine for use on round and deep-drawn parts can handle areas of up to 15-in. diameter.

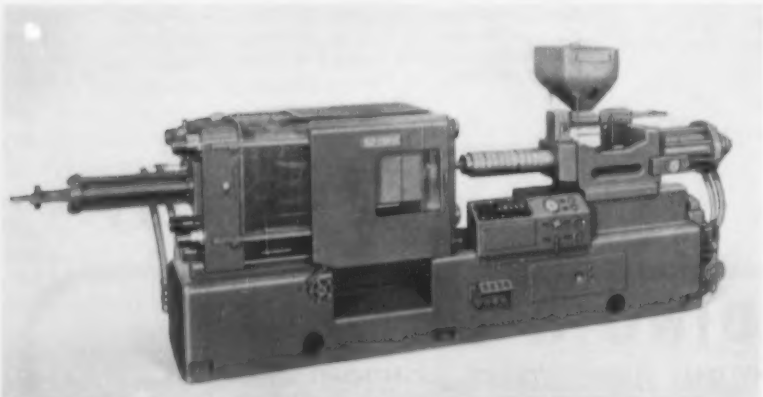
A part to be decorated is put into a mask and a foot pedal or hand valve on the paint machine is depressed. The part is automatically clamped into the mask, to the desired pressure. The guns operate to a predetermined setting, and the clamping cylinder automatically retracts at the end of the cycle. Guns rotate beneath the mask or may be used in a fixed position. Four dials at the front of the machine control atomization of air to gun, speed of gun rotation, length of spray time, and machine air for automation.

The machine is completely enclosed. Air is drawn across and under the top of the machine and exhausted through a 12-in. diameter outlet at the rear. The exhaust needs only 900 cu. ft./min. of free air. Floor space required by the equipment is 32 by 25 inches. Table top is 36 in. high. *Conforming Matrix Corp., 364 Toledo Factories Bldg., Toledo 2, Ohio.*

Die Sinker—Designated No. 3C, this addition to a line of die sinking machines is capable of handling heavy dies within the range of 14- by 24-in. table travel. The machine is equipped with a hydraulic duplicator for tracer control operation. General construction of No. 3C is heavier than current models; the knee, column, and carriage ways are wider. All slide ways are protected by telescoping guards. Table working surface is 15 by 40 inches.

Spindle power is 3 hp., transmitted through a timing belt drive. Spindle speeds range from 30 to 1540 r.p.m. in 16 steps. Knee is counterbalanced by means of a hydraulic cylinder in which pressure can be changed to balance the work load and to assist in raising the knee. Hydraulic motors furnish variable-speed power to table and carriage. Hand-wheels on the machine control servo valves which operate hydraulic assists in moving table carriage, facilitating ease of hand control regardless of weight of die block being cut. *Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn.*

Mold Circulator—Designed for maintaining injection mold temperatures, constant-temperature mold circulator has a built-in thermometer to permit checking temperature of circulating medium. Equipment and specifications are as follows: Motor—⅙ hp., 1725 r.p.m., 220-v., 60-cycle, single-phase, with built-in overload protection; pump—26 gal./



Reed-Prentice's Model 300TA-12/16-oz. injection machine has built-in stuffing arrangement

min. at 3-in. head, 1-in. outlet; heater—4500-w., thermostatically controlled with extra-heavy duty relay, range 50 to 250° F. Equipment comes mounted on casters, and built-in cooling is provided. *Injection Molders Supply Co., 3514 Lee Rd., Cleveland 20, Ohio.*

Laboratory Mill—Compact 6- by 12-in. laboratory mill has two rolls separately and infinitely variable in speed through 8-to-1 range d.-c. motors. The motors are arranged so that one operates from an inverted position, permitting the mill to be designed in such a way that it mounts on a base no larger than that of conventional single-motor mills. Variable rectifiers supply requisite direct current. The mill has anti-friction journals, full-flood lubricated from a separate motorized pumping unit also mounted on the same base.

The machine is recommended by the manufacturer for laboratory uses requiring wide ranges of speeds and friction ratios, and is said to be capable of operating continuously at extremely high temperatures. *Stewart Bolling & Co., Inc., 3190 E. 65th St., Cleveland 27, Ohio.*

Tachometer—Surface speed indicator can be mounted directly on rollers or drums of processing machinery and indicates instantaneously and continuously the rate of speed or change of speed of moving webs of materials. Dial reads directly in ft./min., yd./min., ft./hr., or yd./hour. Instrument can be furnished with built-in counter to simultaneously give total number of yards or feet produced. The indicator can be installed on rollers where the diameter changes continuously because of build-up of material; calibration of the unit is not affected by change in circumference. Meters are available in ranges from 5 ft./min., to 600 yd./minute. *Herman H. Sticht Co., Inc., 27 Park Pl., New York 7, N. Y.*

Continuous Metallizing Machine—Single-chamber continuous-roll vacuum metallizing units require only a single vacuum pumping system (in contrast to previous continuous-roll metallizing machines, which required a dual chamber set-up). The new units are produced in a variety of models to coat plastics materials

Stokes' single chamber, continuous roll metallizer (model shown above handles film of 6-in. width) metalcoats at speeds up to 500 ft./minute

in 6-, 24-, 36-, 48-, 54-, and 60-in. widths at speeds up to 500 ft./minute. Rolls up to 24-in. diameter and gages from 0.0005 to 0.0020 in. can be accommodated.

The machines are designed to deposit a uniform coating of metal over the entire width of the film. They incorporate a device for continuously supplying the metal to be deposited. An observation port set into the cover of the units, plus a fluorescent light source placed behind the coated film, permits the operator to check uniformity of the coating. Speed of travel of the film through the evaporation chamber is adjustable. *F. J. Stokes Machine Co., Inc., 5500 Tabor Rd., Philadelphia 20, Pa.*

Pressure Gage—This compact instrument has been designed to measure mechanical pressures or compressive loads, even in limited spaces. It may be used alone or can be incorporated directly in special testing devices. The gage is built around a "U"-shaped tool steel bar. This bar is claimed to flex innumerable times without losing its resiliency. At the null point of the bar is mounted a dial indicator. Load is normally applied through a hardened ball resting in a steel cup on the top side of the bar. A compressive action tends to close the open end of the bar; this pushes the indicator plunger inward as it moves up against a slanted plunger anvil. Actual force exerted is translated into a direct visual reading on the dial. On capacities up to and including 500 lb., approximately 0.039 in. deflection of the bar is all that is required for a 360° scale reading. Total deflection of the 10,000-lb. model is only $\frac{5}{32}$ inch. Overloads greater than five times capacity can be sustained without injury to calibration by inserting a ¾-in. steel rod between the inner faces of the bar.

The gage is available in the following capacities (lb.)—10, 25, 50, 100, 250, 500, 1000, 2500, 5000, and 10,000. With the exception of the 10-, 25-, and 50-lb. capacities, gages can be supplied with tensile calibration. *W. C. Dillon & Co., Inc., 14620 Keswick St., Van Nuys, Calif.*

Finishing Tool—Multi-purpose hand tool for scraping plastics, sharpening tools, and for use as a hand-held lathe tool has a brazed-on tungsten carbide cutting element with six cutting edges. Model C5 has a ⅛- by $\frac{9}{16}$-in. tip; Model C6 has a ¼- by ⅜-in. tip; and Model C7 has a ¼- by ⅞-in. tip. *Walter H. Bartz Co. 4706 Foothill Blvd., Oakland 1, Calif.*

Resin Dispenser—Developed to fill multiple-mold systems with plastisols, epoxy resins, polyesters, and other liquid resins or plastics, this machine operates on preset cycles and repeats itself until the timing is reset. The equipment is actuated by a push-button and controlled by an electrical timing system. The unit can dispense from 2 g. to 10 lb. for each dispensing action.

The material to be dispensed is supplied from a manifold which is under constant pressure of at least 30 p.s.i., built up by the use of a specially designed pump. No compressed air is used in this dispensing system to actuate any of its phases. *Alka Precision Tool Co., 22-44 122nd St., College Point, N. Y.*

Finishing Machine—Designed to reduce the bright high-gloss finish on laminated panels to a satin luster, this finishing machine also helps to reduce reject rates by blending surface imperfections into the over-all finish.

The satin finish is obtained as follows: Laminated panels are covered with a pumice-water suspension, passed under two rotating Fuller-

gript brushes for dulling, and then through a set of Bristrand brushes for washing. The quality of the finish is determined by the brushing operation, and the machine can be adjusted to any finish requirement. The equipment can also be used to clean the surface of copperclad laminates.

The machine can process 10 to 15 lineal ft./min., and delivers the panels finished, washed, and air-dried.

The Decorative Laminate Satin Finisher is available in two sizes, 50 and 62 in. wide. A minimum length of 36 in. can be processed. Thicknesses from 1/16 to 3/4 in. can be accommodated. *The Fuller Brush Co., Machine Div., Hartford 2, Conn.*

Tube Marker—Model ETMA automatic-feed tube marking equipment, for use on plastics, vulcanized fibre, paper, or fabric strip and tubing is designed to accommodate either automatic or non-automatic numbering machines for consecutive or random numbering. Letter wheels can be substituted for number wheels for letter code markings. The automatic tube feed is adjustable to feed lengths up to 1 in. and will handle tube up to ½-in. outside diameter. Over-all dimensions are approximately 12 in. wide by 18 in. high by 24 in. deep. *The Acromark Co., 561 Morrell St., Elizabeth, N. J.*

Plastisol Dispenser—Three models of vinyl plastisol dispensers have been developed: Model AD can be continuously adjusted to discharge quantities from 15 to 1600 g., at a rapid rate. This model is equipped with a drip-proof nozzle. Model AD-E, using the same type of nozzle, handles from 12 to 1300 g. per discharge. Model MD is a manual dispenser for use where multiple filling is required. This model is for bulk dispensing applications and is non-measuring. *Mercury Industries, Inc., Hillsdale, N. J.*

Air Cylinders—Of square-end design, air cylinders are available in 11 bore sizes from 1½ to 14 in., with 21 types of mountings. They are constructed with brass tubes and are said to meet J.I.C. standards. Pistons and tie rods are secured with lock nuts. On cushioned models, cushions float on O-rings. Cylinders are offered with single- or double-rod ends. *The S-P Mfg. Corp., 12415 Euclid Ave., Cleveland 6, Ohio.*

BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Plastics in Housing"

Published in 1955 by Dept. of Architecture, Massachusetts Institute of Technology. Available through Monsanto Chemical Co., Plastics Div., Springfield 2, Mass. 70 pages. Price: $2.00.

Uses of plastics in housing, both present and future, are described and evaluated in a report summarizing the results of the first year's work on a research project sponsored by Monsanto. Aim of the project is the construction of a house employing the structural and decorative properties of plastics according to sound engineering and architectural principles.

The report is divided into several sections, each dealing with a major area of a house, e.g., foundations, walls and roofs, flooring, openings, ceilings, partitions, and others. Each section is preceded by a summary of the pertinent architectural requirements as well as typical problems. Current uses of plastics in each of these areas of construction are indicated. The final section contains numerous suggestions for the use of plastics to achieve such architectural aims as interior-exterior integration, greater design flexibility, improved light control, new surface colors and textures, and others. A biliography is included.

"Process Engineering Economics," by Herbert E. Schweyer

Published in 1955 by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 409 pages. Price: $7.50.

This textbook for engineering students (it also comes in handy as a reference for practicing engineers) explains the practical use of cost data in evaluating the economic feasibility of processes, based on theoretical economic principles. In its various chapters it covers theoretical engineering economy; accounting and finance data, including cost estimation and operations evaluation; and economic balance to determine the optimum range of operations at lowest cost. The volume has particular relevance in the fields of petroleum, chemical production, plastics, pharmaceuticals, metals refining, food and chemurgical processing, and ceramics manufacturing.

"Matières Plastiques," by J. Jousset

Published in 1955 by Dunod, 92 Rue Bonaparte, Paris 6e, France, in two volumes. Volume I, 328 pages, price 480 F (ca. $1.50); Volume II, 432 pages, price same as for Vol. I.

Though small in size (4 by 6 in.), these two books are encyclopedic in scope, covering both the chemical and engineering aspects of all major plastics materials, from chemical raw materials to final processing operations. Well organized and containing numerous summary tables and charts, these books should prove invaluable to the French-speaking plastics engineer and chemist.

"Chemical Statistics Handbook"

Published in 1955 by Manufacturing Chemists' Association, Inc., 1625 Eye St. N.W., Washington 6, D.C. 412 pages. Price: $3.00.

This publication is a continuation of a series begun in 1940 and formerly titled "Chemical Facts and Figures." It contains a wide variety of official information and all available official statistical data relative to chemical and allied product industries for the years 1950 through 1953 with partial data for the first six months of 1954.

Covered in tabular form are figures on production, employment, wages, wholesale prices, taxes, and import-export activities; financial records of 100 chemical process companies are included.

"Industrial and Manufacturing Chemistry, Part I. Organic," by Geoffrey Martin; seventh edition revised by Edward I. Cooke

Published in 1955 by Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y. 752 pages. Price: $17.50.

This book is a treatise on the applications of organic chemistry in a variety of processes in different industries as found in both American and British practices. The industries covered include: oil, fat, varnish, and soap; sugar; starch; cellulose; fermentation products; charcoal and wood-distilling; turpentine and rosin; industrial gums and resins; rubber; aliphatic chemicals; fuel gas; coal-tar; synthetic dyes, natural dyes, and inks; paints and pigments; textile fiber, bleaching, and waterproofing; leather; glue, gelatin, and albumen; printing; drugs; plastics; photographic chemicals; and tobacco. For each section detailed information on practical uses of organic chemicals is provided, including machinery, processes, and practices.

"Vapor Plating," by C. F. Powell, I. E. Campbell, and B. W. Gonser

Published in 1955 by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 158 pages. Price: $5.50.

Providing data on the formation of metallic and refractory coatings by vapor deposition, this volume (dealing solely with chemical processes) describes and gives critical reviews of general techniques, together with their past and present applications. The conditions required for the deposition of pure metals, carbides, nitrides, borides, silicides, and oxides from gaseous mixtures of their evaporated compounds are discussed. Also included is information on properties of the newer coatings that have been developed, the bases on which they may be deposited, and the conditions suitable for their applications. A review of the unusual characteristics of vapor-deposited materials is given.

Strippable coatings—Bulletin M-3 describes a strippable plastic coating for the temporary protection of lacquered, painted, and enameled surfaces. This sprayed-on, viscous, water-base compound forms a tough, resilient, inert film for these surfaces, protecting them against scratches, dirt, and paint overspray. *Spraylat Corp., 1 Park Ave., New York 16, N. Y.*

Sheet forming—Four-page folder gives specifications and operation details for a vacuum forming machine for forming, draping, and deep-drawing. The machine can be operated manually, semi-automatically, and fully automatically; operates high and low molds at same

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time; is reported to eliminate warm up; and provides variable heat control and spot zone heat control. *Comet Industries, Franklin Park, Ill.*

Protective coating—This 19-page report, entitled "Comparative Properties of Protective Coatings," contains information on 14 types of coatings used widely to protect equipment, walls, beams, and ceilings in plants where fumes and industrial atmospheres cause corrosion. Included are physical and chemical data and a three-page section on the selection of coatings. A chart compares coatings as to protection against weather, impact, abrasion, heat, water, and various chemicals. *The Atlas Mineral Products Co., Mertztown, Pa.*

Abstracts index—The first annual index to "Chemical Market Abstracts," a monthly literature research service covering market news and statistics for the chemical industry, contains over 22,000 entries classified under the following six headings: company names, foreign countries, trademarks, industrial uses of chemicals, domestic and foreign patents, and unit-consumption factors as reported in the trade press. The index is of value only in connection with the abstracts. $20. *Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y.*

Label catalog—Catalog illustrates a complete line of pressure-sensitive contact labels and label dispensers. *Archer Label Co., 783 Kohler St., Los Angeles 21, Calif.*

Do-it-yourself—Buyers' guide lists 1129 different lines of products that may be of interest to hobbyists. Stated purpose of the directory is to make it easier for home owners, home craftsmen, etc., to buy some of those hard-to-find items that creep into so many do-it-yourself projects. $1.00. *Do-It-Yourself Buyers' Guide, 4828 Lincoln Ave., Chicago 45, Ill.*

Chemical textile processing—Model DR-400 Ultrasonic Vibrator for agitation, emulsification, dyeing, scouring, and bleaching is described in this two-page bulletin. An explanation of its above-audibility sound wave principle of operation, and complete specifications are presented. Application notes are included. *Acoustica Associates, Inc., Shore Rd., Glenwood Landing, L. I., N. Y.*

Teflon stock—Bulletin 300 catalogs a line of Teflon stock and describes a custom fabricating service. Included are tables and descriptive matter on the chemical, electrical, thermal, and mechanical properties of Teflon, as well as application notes. Standard dimensions, weights, and tolerances for sheet, tape, molded cylinders, and bars; extruded tubing and rods; electrical spaghetti; beading; and extruded shapes are tabulated. Special molding techniques and methods of bonding Teflon to other products are described and facilities for fabricating by molding or machining are detailed. *United States Gasket Co., Camden 1, N. J.*

Gelling agent—Technical Bulletin SD-30 contains formulations for gelling or thickening a wide range of

organic and aqueous systems with Permagel, a purified, grit-free colloidal Attapulgite which is said to be effective in imparting good thixotrophy and heat stability. Gelling procedures are outlined. *Minerals & Chemicals Corp. of America, Metuchen, N. J.*

Rare chemicals—Folder describes the National Registry of Rare Chemicals. The registry, as the name indicates, keeps track of rare chemicals as a free service for individuals and firms seeking compounds they cannot locate at regular supply houses. While not a storehouse of chemicals, the registry has catalogued on cards more than 30,000 rare chemicals. *Armour Research Foundation of Illinois Institute of Technology, 10 W. 35th St., Chicago 16, Ill.*

Gluconic acid—Technical Bulletin No. 33 outlines the uses and properties of gluconic acid, a relatively non-corrosive and non-toxic organic acid made by fermentation. Charts, reactions, derivatives, applications, assay information, specifications, and a number of selected references are included. Properties of gluconic acid, a polyhydroxy monocarboxylic acid, suggest that it can be acetylated and phosphorylated to yield a number of interesting derivatives. Stable aromatic amides and aliphatic and unsubstituted amides can be prepared, normal salts of gluconic acid are readily formed and isolated, and many metal gluconates are commercially available. *Chas. Pfizer & Co., Inc., Chemical Sales Div., 630 Flushing Ave., Brooklyn 6, N. Y.*

Mold making—Handsomely prepared 16-page booklet tells the history and current activities and facilities of a pattern making establishment producing, to customers' specifications, wood patterns, metal patterns, and complete metal molds for laminated plastics molding and for the shell molding process of producing castings. *Engelking Patterns, Inc., Columbus, Ohio.*

Printed circuits—The second edition of "Mechanize Your Wiring—With Copper-Clad Phenolite" uses photographs, schematics, and tables to illustrate the advantages of printed circuitry over conventional hand-wiring methods. It also includes a

discussion of the economies of printed circuits and a description of the ways in which printed circuits are produced. Specifications are presented on the various types and grades of laminates used as base material for printed circuits, including a glass cloth-epoxy resin combination with properties which recommend it for circuits requiring high heat and moisture resistance. *National Vulcanized Fibre Co., 1055 Beech St., Wilmington 99, Del.*

Product services—Facilities and services available for the design and manufacture of plastics products are described in this eight-page brochure. Included is information on injection molding, engineering and designing, quality control, extrusion, decorating, and tool and die making services. *Superior Plastics, Inc., 410 N. Oakley Blvd., Chicago 12, Ill.*

Phenolic prices—Domestic price schedule No. 23, for Resinox phenolic molding compounds, lists prices for the entire line. Prices are per pound in bag and drums for carload or truckload and less than truckload. The list covers general-purpose, high-impact, electrical low-loss, heat-resistant, and special-grade materials. *Monsanto Chemical Co., Plastics Div., Springfield 2, Mass.*

Nylon-6—Series of bulletins details applications of and molding techniques for Akulon, a ε-caprolactam based nylon-6. These bulletins include the following: 16-page booklet "How to Get the Best Out of Nylon" presents injection molding techniques; Bulletin E-1002 deals with gears; Bulletin E-1003 discusses the subject of machining; Bulletin E-1004 presents extrusion and wire coating techniques; Bulletin E-1009 gives data on dimensional stability; Bulletin E-1010 covers coloring; Bulletin E-1024 is concerned with molding powder; and Bulletin E-1025 discusses welding. *Algemene Kunstzijde Unie N.V., 23 Flint St., Asheville, N. C.*

Packaging newsletter—Latest packaging developments and applications of plastics are summarized in a new monthly newsletter for extruders, converters, and coaters. Named "Packaging with Plastics," the publication presents case histories of successful packaging applications,

"Thermex Plastic Preheaters outstanding! ...Faster cycles, fewer rejects, less maintenance"

Says **Marvin G. Johnson,** *Supt., Sperzel Co.*

Five THERMEX* Plastic Preheating Units are used at the Sperzel Company, Minneapolis, for heating toilet seat preforms. Here is what Marvin G. Johnson, Superintendent, reports on performance:

"In over fifteen years of molding we have used several types of preheaters ... but there is no doubt that THERMEX equipment is outstanding. We find faster cycles, less rejects and greatly reduced maintenance cost have given us a far smoother and more profitable molding operation."

Studies of operating figures show that rejects were reduced 33%—an important gain since rejected material cannot be salvaged. Production rates increased 33%, and maintenance costs were cut in half!

Find out how *you* can operate more profitably with THERMEX Plastic Preheating Apparatus. Call or write The Girdler Company, Thermex Division, Louisville 1, Kentucky.

*THERMEX — Trade-Mark Reg. U. S. Pat. Off.

This 7.5 kw unit can heat 6 pounds of material from 80°F to 250°F in just one minute. Power is applied automatically when the sliding drawer is closed; shuts off after a preset interval.

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239 Newton Ave., Newark, Ohio • 624 So. Michigan Ave., Chicago 23, Illinois • 714 West Olympic Blvd., Los Angeles, Calif. • 1100 Craig St. East, Montreal, Quebec, Canada

technical data on basic resins, and new and unusual packaging ideas on the use of plastics in the packaging field, including polyethylene and cast vinyl film, and paper, film, and foil coated with polyethylene or vinyl resins. The initial issue is distributed in a printed polyethylene film envelope. *Bakelite Co., a Div. of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.*

Laminated pipe—Four-page bulletin describes a line of Fluoroflex-T laminated fluorocarbon resin-woven glass pipe. Physical and chemical properties, specifications, description of flanging and coupling in the field with a special tool, as well as suggested applications for the chemically inert plastic pipe are included. *Resistoflex Corp., 39 Plansoen St., Belleville, N. J.*

Adhesives — Eight-page manual, titled "Adhesive Bonding," covers such typical adhesive applications as: aircraft aluminum honeycomb construction; fin tubing heat exchanger assemblies; new advances in printed circuitry; etc. A discussion of the proper approach to selection of the correct formulation and process for a particular requirement is included. *Rubber & Asbestos Corp., 225 Belleville Ave., Bloomfield, N. J.*

Pumps — Bulletin W-414-B45A covers vertical Triplex single-acting plunger pumps with 2-, 4-, 5, and 6-in. strokes, capacities up to 225 gal./min., and pressures up to 11,700 p.s.i. Data on the use of these pumps in water flooding and salt water disposal, hydraulic press systems, hydraulic descaling systems, and other industrial process pumping applications are presented. A rating chart lists the various type pumps with information on size, speed, displacement, discharge pressure, etc. *Worthington Corp., Harrison, N. J.*

Automation—The current issue of *Kelloggram* has as its subject automation in the petroleum and chemical industries. Diagrams are used to illustrate the basic functions of instruments used in automatic control. One section describes the use of radioisotopes in level measuring devices. Other sections discuss data reduction systems, electronic instrumentation, stream analyzers, and

890-ton Multiple Opening Platen Press (HydroLectric). This precision press is designed for polishing and laminating plastic sheets. Complete unit includes a 10-opening press, 20-opening loading and unloading elevator, two-pressure pumping unit and an automatic pressure and temperature control system. Write for catalog and engineering information on this and other R. D. Wood hydraulic presses for rubber, plastics, metalworking, and woodworking—without obligation.

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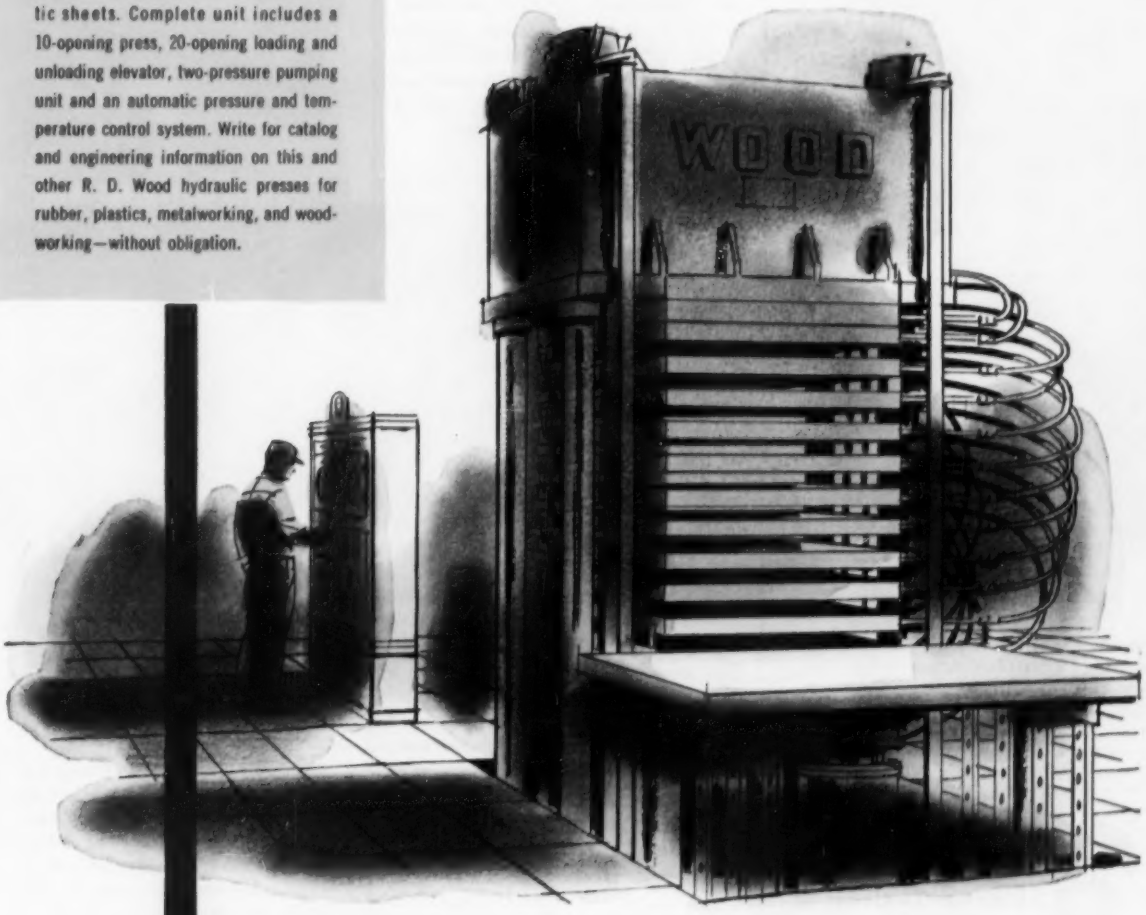
Gratifying things begin to happen when you put an R. D. Wood press in your plant. First of all, you'll probably notice a higher rate of production. Next, downtime for maintenance shrinks to a minimum. Finally, quality of work is improved. *Smooth, troublefree performance* underlies all of these advantages. And this, in turn, results from the scrupulous design, superior materials, and painstaking workmanship that go into *every* R. D. Wood press. Since 1803, our nameplate has stood for unquestioned excellence.



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high-pressure instruments. *The M. W. Kellogg Co., 225 Broadway, New York 7, N. Y.*

Templets—Fifth edition of Anchor Bushing catalog presents a complete line of bushings for laminated plastics and sheet metal drill templets. Step-by-step instructions on how to make drill templets with these bushings are included. Price and ordering information is given. *Hi-Shear Rivet Tool Co., 8924 Bellanca Ave., Los Angeles 45, Calif.*

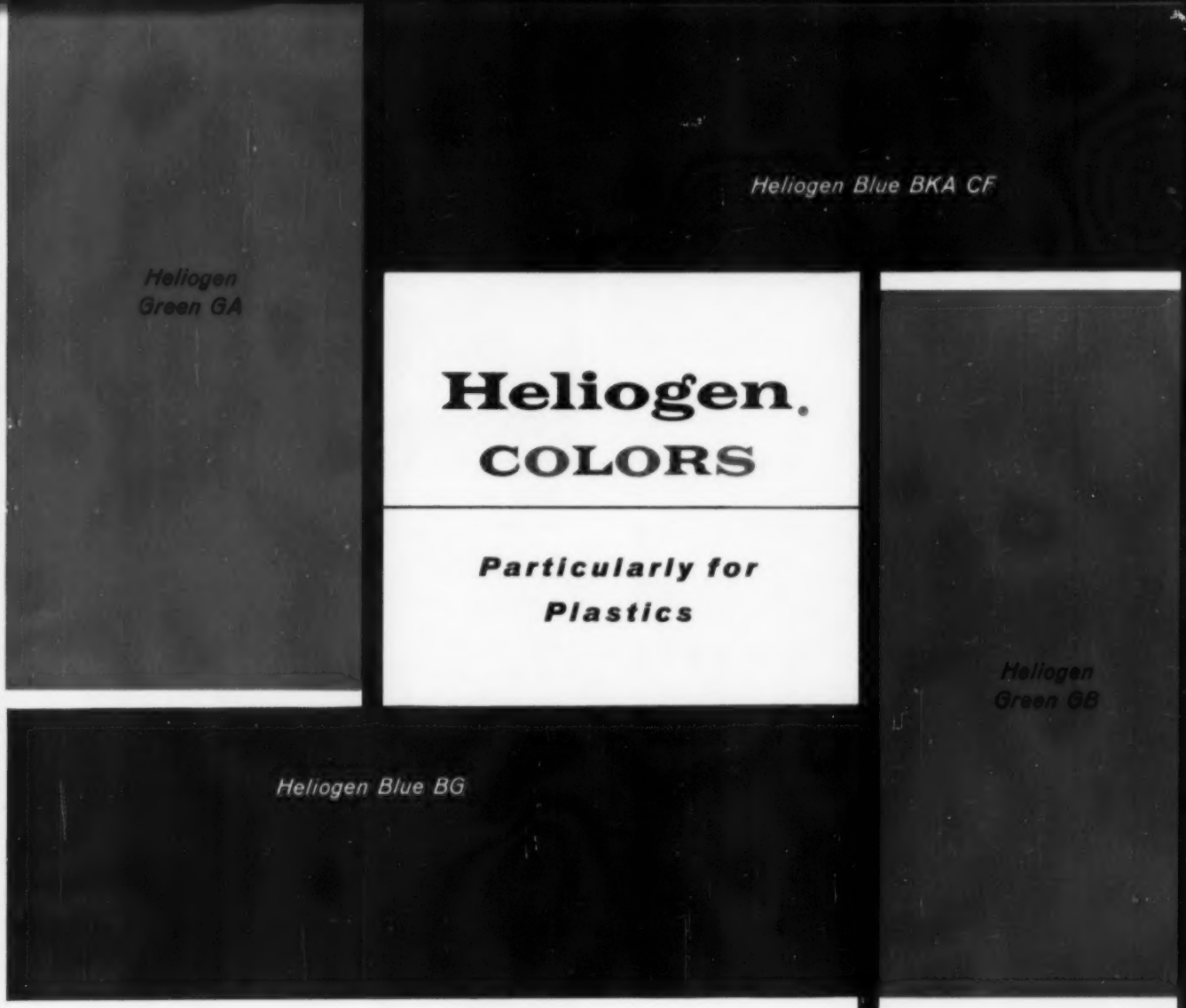
Reinforced plastics processing — Four-page catalog folder 55A-DCP describes a line of diamond-coated steel tools for use with reinforced and laminated plastics materials. Included are saws, edge planers, burrs, and grinding wheels. Recommended applications for all tools are indicated. *Dia-Chrome Co., 722 S. Verdugo Rd., Glendale 5, Calif.*

Materials research—"A Review of the Air Force Materials Research and Development Program," contains abstracts of 130 reports of research done under the Air Force's materials research and development program from July 1, 1953 to June 30, 1954. The review covers abstracts of research in metallurgy, textiles, petroleum products, structural materials, rubbers, plastics, packaging, protective treatments, and analysis and measurements. $2.75. *U. S. Dept. of Commerce, Office of Technical Service, Washington 25, D. C.*

Contact cement—One-page "trouble shooter" lists the most common gluing errors and their causes, and the best ways to eliminate them. It is designed for furniture fabricators and others who use contact cement in applying decorative laminates, leather, linoleum, synthetic rubber, and thin-gage metal to plywood, pressed wood, and similar materials. *The Borden Co., Chemical Div., 350 Madison Ave., New York 17, N. Y.*

Hermetic seals—Four-page folder describes a line of hermetic metal-to-ceramic seals for high-temperature and high-pressure applications. Dimensions and specifications are given. *Advanced Vacuum Products, Inc., 18 Liberty St., Stamford, Conn.*

Polyester colorants—Technical Bulletin 160 describes the 400-series of



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Phthalocyanine pigments unequalled for... brilliance of shade... fastness to light... tinctorial value

Heliogen Colors are supplied in powder or presscake form—according to the user's requirements. Compounders of plastics—and particularly the Vinyl plastics—standardize on these colors for their ease of handling, their chemical stability and their brilliance. (This page was printed with inks made from the Heliogen Colors as indicated.)

The powders are noted for ease of grinding. The corresponding presscakes flush readily into the plasticizers normally used. All are non-crystallizing in the presence of aromatic solvents—with the exception of Heliogen Blue BKA Powder CF. All are relatively heat stable—particularly the Heliogen Blue BG Powder which is outstanding in this respect.

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Masonry blades—Bulletin A-1308 describes the "Niagara" line of masonry blades. Information included covers blade types and sizes, applications, a comparative grade chart, a description of a blade identification system, and ordering information. Fibrous glass-reinforced cut-off wheels are covered (see MODERN PLASTICS *33*, 140, Sept. 1955). *The Carborundum Co., Niagara Falls, N. Y.*

Reinforced plastics—Entitled "Products for Plastics Reinforcements," this booklet covers the more important aspects of the following subjects: reinforcements (glass cloth, mats, roving strands, yarns); plastics (phenolic, polyester, epoxy, etc.); molding processes (contact, vacuum bag, pressure bag, flexible plunger, matched die, compression, transfer, and injection); physical properties of various molding compounds; and design considerations. The booklet stresses the fact that fibrous glass-reinforced plastics present a wide range of design potential. Numerous illustrations of successful applications are given. *Owens-Corning Fiberglas Corp., Plastics Reinforcement Div., 598 Madison Ave., New York 22, N. Y.*

Chemical literature—This 18-page checklist of company literature covers reference manuals and handbooks, technical bulletins and data sheets, product folders and leaflets, and miscellaneous publications. The various publications listed in the checklist describe a complete line of chemicals and their diverse applications. Both technical and non-technical publications are included. *Diamond Alkali Co., Union Commerce Building, Cleveland 14, Ohio.*

Thickness measurements — Data sheet No. 10.9-1a describes equipment for thickness or weight control of plastics, rubber, foil, and other moving sheet materials. Thickness or weight per unit area are continuously measured and controlled without contacting the moving web by

Tracerlab Beta gages equipped with Brown ElectroniK instruments. Applications, principles, features, and instrumentation are given as well as information on accuracy and personnel protection. *Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Philadelphia 44, Penna.*

Double-wall containers—Combination catalog page-price sheet on a line of double-wall cosmetic containers with polystyrene inner and outer shells and urea covers, lists eight sizes, from ⅛ to 8 ounces. Information on weights, colors, packing, and terms are included. *Plastics Div., Colt's Mfg. Co., Hartford, Conn.*

Rubber-phenolic—Sixth edition of "Design File" for rubber-phenolics (CDC-237A) has been expanded to include the latest rubber-phenolic applications tested in electrical equipment, appliances, electronics, and machinery. Containing 25 case histories, the brochure can serve as a handbook for evaluation and use of rubber-phenolic molding materials. New design possibilities and tested suggestions for upgrading standard products are included. *General Electric Co., Chemical Materials Dept., Pittsfield, Mass.*

Management—Bulletin 567 contains the principal subject matter of the papers delivered at the S.P.I. Accounting and Financial Committee industry meeting, held at the Sheraton Astor Hotel, New York City, June 9, 1955. Subjects covered are: "New Techniques in Reporting to Management," by Ernest A. Carlson (Johnson & Johnson); "Direct Costing," by Malcolm C. Boggs (General Electric Co.); and "Estimating," by Ned H. Porte (General American Transportation Corp.) *The Society of the Plastics Industry, Inc., 67 W. 44th St., New York 36, N. Y.*

Vinyl for windows—Entitled "Vinyl Plastic Extrusions for the Metal Window Industry," this 20-page booklet presents a summary of the principles and application of plastic extrusions for window channeling, splines, seals, and weather stripping, with particular reference to the design characteristics of these materials. *Irvington Div., Minnesota Mining and Mfg. Co., 6 Argyle Terrace, Irvington 11, N. J.*

If you **MUST** stop Corrosion

KEL-F® PLASTIC WILL

KEL-F Plastic Molded and Fabricated Valve Linings, Valve Diaphragms, Gaskets, Ring Seals, Gauge Crystals, KEL-F Dispersion Coated or Laminated Lined Tanks, Vessels, Reactors, Piping and Tubing can protect your plant equipment against chemical corrosion

KEL-F Fluorocarbon Plastic is the best non-permeable, corrosion-proof material available today. It is inert to virtually any type of chemical attack—including mineral acids, oxidizing agents as well as strong caustics. When nothing else will protect equipment, KEL-F Plastic usually will.

HERE ARE SOME OF ITS OUTSTANDING CHARACTERISTICS:

Temperature Tolerance

Exhibits satisfactory properties over a temperature range of approximately 710° F. (—320° F. to 390° F.)

High Compressive Strength

Pressures of 8,000 psi result in only 4% to 5% permanent set. Line seals are retained longer when gaskets and O-ring seals are made of KEL-F Plastics.

Non-Adhesive

KEL-F Plastic is non-wetting even after long periods of immersion. Surface is anti-fouling when in contact with even the most viscous liquids.

KEL-F Plastic Dispersions have been developed for bake-coating of metallic surfaces that must be corrosion resistant, anti-adhesive and electrically non-conductive. These Dispersions can be applied by spraying, spreading or dipping.

The full story of what KEL-F will do for you is worth having. Write or call for additional information.

New! KEL-F Plastic Dispersions

KEL-F Plastic Dispersions have been developed for bake-readily molded by extrusion, transfer and injection. Available in sheets, rods, tubing and film, it can be fabricated, heat formed, machined and heat-sealed by a growing list of experienced fabricators.

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PLASTICS AND SYNTHETIC RESIN PRODUCTION
From Statistics Compiled

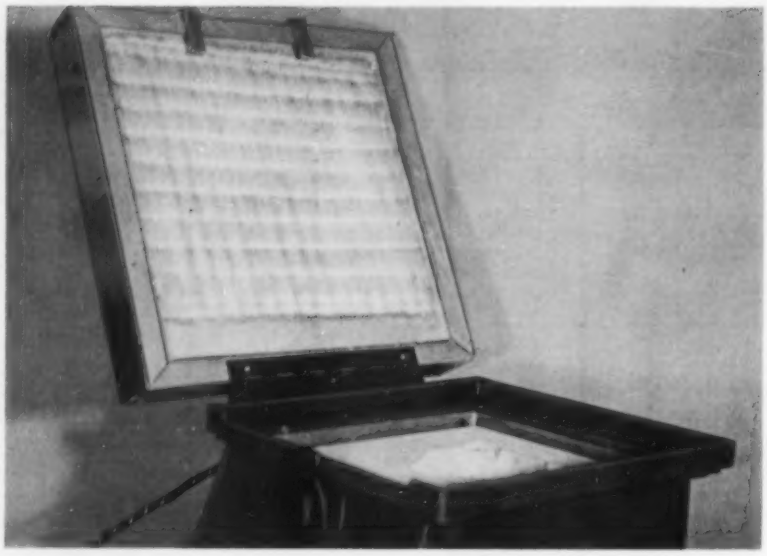
Materials	*Total p'd'n. first 6 mos. 1955*	*Total sales first 6 mos. 1955*
CELLULOSE PLASTICS:[a]		
Cellulose acetate and mixed ester		
Sheet, under 0.003 gage	9,534,567	9,447,363
Sheets, 0.003 gage and over	7,734,484	7,235,030
All other sheets, rods, tubes	3,931,844	3,554,584
Molding, extrusion materials	44,563,293	43,193,505
Nitrocellulose sheets, rods, tubes	2,506,537	2,617,865
Other cellulose plastics	3,333,417	3,044,789
PHENOLIC AND OTHER TAR-ACID RESINS:		
Molding materials[a]	105,963,049	99,062,831
Bonding and adhesive resins for:		
Laminating (except plywood)	34,016,622	24,872,240
Coated and bonded abrasives	7,556,654	8,102,182
Friction materials (brake linings, clutch facings, etc.)	13,147,369	12,003,758
Thermal insulation (fiber glass, rock wool)	22,302,453	22,518,389
Plywood	22,625,143	18,804,521
All other bonding and adhesive uses	9,251,733	9,231,793
Protective-coating resins	12,941,225	12,892,354
Resins for all other uses	19,315,022	17,872,856
UREA AND MELAMINE RESINS:		
Textile-treating and textile-coating resins	21,200,708	20,346,706
Paper-treating and paper-coating resins	10,734,661	10,250,990
Bonding and adhesive resins for:		
Plywood	47,803,252	44,377,503
All other bonding and adhesive uses, including laminating	14,254,799	14,221,885
Protective-coating resins	19,053,739	14,323,856
Resins for all other uses, including molding	39,918,443	38,085,337
STYRENE RESINS:		
Molding materials[a]	202,244,401	188,217,136
Protective-coating resins	50,647,328	48,211,345
Resins for all other uses	41,806,713	40,274,364
VINYL RESINS, total[b]	339,821,164	326,441,653
Polyvinyl chloride and copolymer resins (50 percent or more polyvinyl chloride) for:		
Film (resin content)		43,264,947
Sheeting (resin content)		26,196,689
Molding and extrusion (resin content)		92,143,554
Textile and paper treating and coating (resin content)[c]		30,797,887
Flooring (resin content)		28,921,167
Protective coatings (resin content)		14,576,634
All other uses (resin content)		23,995,254
All other vinyl resins for:		
Adhesives (resin content)		15,503,538
All other uses (resin content)		54,041,983
COUMARONE-INDENE AND PETROLEUM POLYMER RESINS	126,286,260	126,090,872
POLYESTER RESINS:		
For reinforced plastics	26,883,157	21,790,356
For all other uses	1,832,056	2,077,899
POLYETHYLENE RESINS:		
MISCELLANEOUS:		
Molding materials[a,d]	110,266,595	82,452,518
Protective-coating resins[a]	2,295,541	1,369,784
Resins for all other uses[f]	55,042,356	73,813,421

[a] Dry basis designated unless otherwise specified.
** Partially estimated. † Revised.
[b] Includes fillers, plasticizers, and extenders. [b] Production statistics by uses are not representative, as end use may not be known at the time of manufacture. Therefore, only statistics on total production are given. [c] Includes

IN POUNDS* FOR MAY AND JUNE 1955 by U.S. Tariff Commission

*May***		*June***	
Production	*Sales*	*Production*	*Sales*
1,253,143	1,359,224	1,707,652	1,767,138
1,349,317	1,185,311	1,434,461	1,365,705
644,967	563,701	760,460	718,989
7,758,301	7,464,172	7,723,252	7,458,227
402,714	396,181	415,174	378,722
550,509	609,946	333,259	278,710
†17,706,724	†16,097,449	17,540,389	17,739,914
†5,986,314	†4,467,890	5,770,941	4,551,788
1,428,918	1,387,774	1,648,765	1,748,940
2,111,997	2,097,977	2,787,385	2,500,850
4,170,813	4,059,745	5,162,480	5,017,941
3,434,167	2,763,650	3,966,008	3,311,631
†2,135,943	†2,126,287	2,269,384	2,135,288
2,431,254	2,061,582	2,427,490	2,482,534
†2,900,993	†2,541,222	2,660,619	2,495,115
3,377,497	3,186,324	3,049,339	2,918,617
1,744,910	1,697,081	1,636,475	1,280,207
8,399,031	7,560,602	8,209,169	7,673,732
1,908,848	1,970,105	2,407,088	2,441,859
3,548,538	2,651,434	3,522,095	2,479,299
†7,208,867	†6,804,591	5,929,419	5,330,487
35,470,807	31,816,171	34,604,231	28,944,532
9,059,629	7,720,016	8,820,871	7,924,761
7,078,697	7,532,005	7,668,970	6,437,161
†61,730,829	†55,292,634	56,117,522	52,630,165
	6,984,897		7,103,601
	4,429,090		3,969,696
	14,452,489		14,832,342
	5,240,024		5,035,689
	5,108,558		4,317,783
	2,448,552		2,138,727
	†4,583,793		4,402,650
	†2,808,594		2,322,066
	9,236,637		8,507,611
22,503,247	21,007,363	20,993,056	21,357,009
4,929,504	4,400,101	5,562,760	4,292,873
297,626	248,357	249,040	205,024
†32,507,563	†28,063,012	30,390,036	27,930,266
4,276,291	†3,793,801	4,294,959	3,867,582
370,686	196,254	395,940	246,274
6,738,794	†6,562,524	6,646,002	6,143,772

data for spreader and calendering-type resins. ⁴ Includes data for acrylic, polyethylene, nylon, and other molding materials. ⁵ Includes data for epichlorohydrin, acrylic, polyester, silicone, and other protective-coating resins. ⁶ Includes data for acrylic rosin modifications, nylon, silicone, polyethylene, and other plastics and resins for miscellaneous uses.



Model vacuum forming machine, only 16 in. high, but complete in most details, including fibrous glass radiant heater, is intended for use in testing materials and mold design

Miniature Vacuum Forming Machine

EXPANDING interest in the application possibilities of the vacuum forming technique has prompted the development of a small-scale, low-cost model forming machine that can be used for experimental purposes.

Although it measures only 16 in. high, 15 in. wide, and 18½ in. deep, the portable, hand-operated unit is a piece of precision equipment that operates on the same principles as the standard-size production machines. It is marketed by Precision Products Co., East Paterson, N. J., for $49.95 and is intended primarily for use by fabricators already engaged in vacuum forming who want to test plastic sheeting or mold materials without tying up production, men, and equipment; by fabricators interested in entering the vacuum forming field; by designers and manufacturers anxious to experiment with new mold designs and ideas before going into full production; by vocational schools (and in the Industrial Arts departments of academic schools); or by other industries (or even home craftsmen).

At the present time, the only model available operates on the principles of a straight vacuum

First step in forming is to clamp the plastic sheet in place over the mold

After heater in swung down and sheet heated, vacuum is pulled by hand

forming machine. Precision Products Co., however, expects to introduce a model drape forming machine which will sell for about $15 to $20 more than the current model.

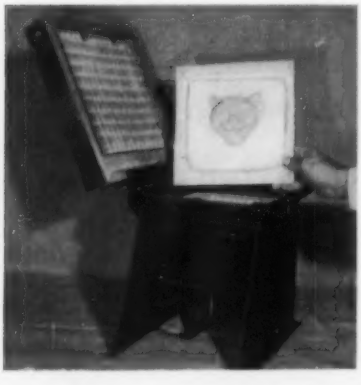
The model forming machine incorporates a small standard-type fibrous glass radiant heater capable of developing a face temperature of approximately 750° F. The entire unit weighs only about 16 lb. and operates on 110-v. alternating or direct current.

When forming an object, the female mold is first placed in the 8¾- by 8¾- by 2-in. bed of the machine. Blocks of wood are fitted into the spaces between mold and bed to hold the mold securely in place. The plastic sheet (up to 10- by 10-in. in size) is then clamped into position over the mold and the heater, which is hinged at the back to the top of the machine, is swung down.

When the sheet has been heated to the proper temperature, the vacuum is pulled by pumping on the handle of the vacuum pump. One to six strokes, depending on volume of mold, evacuate the mold chamber.

After forming, the heater is swung up, the sheet unclamped, and the formed piece removed. Maximum depth of draw is 2 inches.

Because of the myriad number of applications to which the vacuum forming technique can be adapted and because of the many variations of plastics sheet materials and mold materials that are being made available to the fabricator, the minature vacuum forming machine should prove of value in helping to solve the problems associated with the production of many three-dimensional plastic forms.



Heater is then swung up, sheet is unclamped, and formed piece removed

Two parts (foreground) of special valve for inflatables are molded of vinyl

Vinyl Valve

AN ALL-VINYL flexible push-pull valve, designed especially for low-cost inflatables, seals so easily, it can actually be closed with pressure of the tongue.

The valve is molded in two pieces: a one-piece stem and seat and a cylindrical valve body. When the stem is pulled up from the body, air passes from the inflated product through a molded-in hole in the bottom of the valve body and out through the hole stem—or in the opposite direction if the product is being inflated. When the stem is pushed down after inflation, however, the molded-in seat at the foot of the stem closes off the air hole to provide an air-tight seal. The top of the stem has molded-in ridges for easy gripping.

A flange is molded around the top of the valve body to facilitate heat-sealing. Vinyl film can be heat-sealed to the valve either under the flange or on top of it.

Although the valve can be opened, inflated, and closed by mouth alone, it also fits standard connections such as air hose, bicycle pump, etc. If cleaning should be necessary, the valve can be dis-assembled by twisting the stem out of the body.

The all-vinyl valve is virtually indestructible. It can be stepped on and subjected to extreme abuse without impairing its effectiveness. And because it does not incorporate any metal parts, it cannot tear the inflatable during shipping or storage.

CREDITS: The No. 320-AC vinyl valve is a product of Halkey-Roberts Corp., Paramus, N. J.

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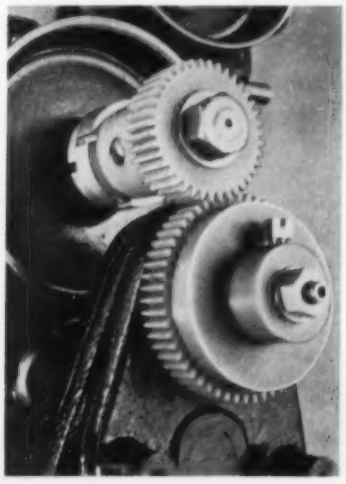
RODS for fabrication supplied in various diameters and lengths for convenient machining

Which of these outstanding properties are *you* after?

toughness
dimensional stability
wear resistance
chemical resistance
temperature resistance
self-lubrication
tensile strength
resilience
dielectric properties
machinability
colorability
ease of processing
uniformity

akulon nylon **provides them *all!***



NYLON GEARS – Akulon nylon can be made into tough, quietly-operating gears by molding or machining methods.

Akulon nylon is produced by A.K.U. (Algemene Kunstzijde Unie N. V.) in Arnhem, Holland. The bulletins listed above and additional details are available from the U. S. Sales Agents.

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LOOK

* LOOK Magazine photo

LOOK told in its January 25 issue under the heading, "What's behind the German comeback?" about Carl Gisbert Siebel, a maker of injection molding machines and molds for plastics:
"He Gambled — and He Won." All Siebel had in 1945 were business contacts — and some capital. His present plant could be bought cheaply because it was marked for dismantling. He raised the money to buy; gambled that the Allied dismantling program would be halted in time — and he won. Today his plant is one of many "small factories . . . where highly skilled workers turn out the machinery, the precision instruments and the tools that are capturing some of the world's most highly competitive markets."

And here is C. G. Siebel speaking up for himself:
When LOOK talks of our "higher efficiency, lower labor costs and intensively developed skills," it hits the nail on the head for the firm of Sommer in Luedenscheid. Our top-notch designers and workmen make injection molding machines and precision molds for $1^1/_2$ to 12 ounces, and they're a pleasure to watch. Each of our machines is individually driven — plug in anywhere, and away you go; it can be fully or semi-automatic, as you like. And even a beginner can learn to run it in practically no time. Changing molds is a matter of minutes. Let me tell you more — no obligation, of course.

DR. ING. SOMMER

C. G. Siebel, President

F. SOMMER

LUEDENSCHEID, WESTERN GERMANY

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The new model M & M Dicer cuts perfect cubes from sheets up to ⅛" thick at speeds up to 85' per minute. Pellet shape of the notched knife dicer can be changed by adjustment of the feed roll speed. Straight knives are used for cutting extruded rods. Straight feed for better stock control. Available in three sizes to cut up to 6", 10", and 14" width plastic ribbons. Enquiries welcomed on larger capacity machines, too.

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Styrene TV Mask

ONE of the largest television picture tube masks in use today is being injection molded in one piece of high-impact styrene for RCA's new 21-in. TV receiver.

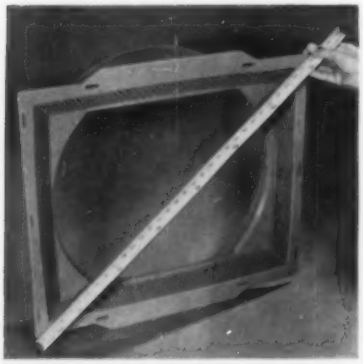
The mask weighs approximately 5.8 lb. (the former model weighed about 3.25 lb.) and measures 24¾ by 22 inches. To fit in with the requirements of the new receiver, the flange of the mask was lengthened to 3 in. and wall thickness in this area was increased to 0.375 inch. Another unusual design feature called for molded-in corrugations around the perimeter of the mask.

To do the job, the molder used a 200-oz. machine, equipped with preplasticizer, and developed a 1.8-min. cycle. Since a durable piece with good finish was specified, high-impact styrene was selected.

Most ticklish problem in constructing the mold for the mask was the design of the part forming the corrugations. Since these are intended to be functional rather than purely ornamental, dimensions and surface smoothness were critical.

On first trials, the 3-in. flange made release of the molded piece difficult, but modification of the design of the ejection pins overcame this difficulty. Particular attention also had to be given to placement and diameter of cooling channels because of extreme variation in wall thicknesses—0.062 in. across corrugations to 0.375 in. at the flange.

CREDITS: Mask is molded by Amos Molded Plastics, Edinburg, Ind., on a Watson-Stillman machine; Lustrex Hi-Test 88 high-impact styrene is supplied by Monsanto Chemical Co.



Styrene TV mask, 24¾ by 22 in., molded in one piece on 200-oz. machine

Phenolic Laminate for Golf Club Heads

THERMOSETTING laminated plastic, already a well known factor in many modern industrial applications, is now finding a new market in the sports world as inserts for the impact surfaces of golf club heads. It has been found that the new clubs outdrive the old type.

The laminate, a cotton mat filler impregnated with phenolic resin and known as Synthane Grade LRF, was selected by Bailey & Izett, Ardmore, Pa., as the most suitable type of insert material for its line of custom-made golf clubs. Originally, design specifications had called for pressed cellulose fibers, but this material was soon found unsatisfactory. The fibers formed an inelastic, "dead" material which would splinter and absorb moisture, eventually causing the fibers to swell and sometimes to delaminate.

The phenolic laminate, in contrast, is impact- and splinter-resistant, resilient (its modulus of elasticity is close to that of the average golf ball), extremely durable (the use of random-distributed fibers instead of woven fabric gives this grade of material equal strength crosswise and lengthwise), and, of especial importance, dimensionally stable—an important consideration where extremes of heat and dampness can cause shrinking or swelling with subsequent damage to the golf club faces.

Other advantages of the new material include longer service life, better performance, and high product eye-appeal made possible by the availability of the laminate in several colors.

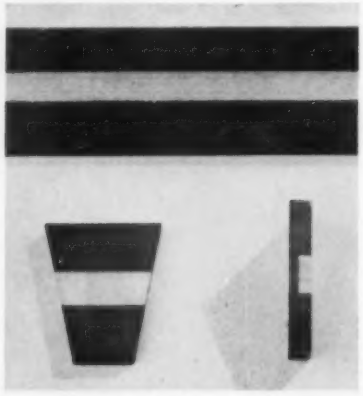
In the production of the laminate, the cotton mat is first coated with phenolic resin, dried, and cut into sheets. Percentage-wise, the impregnated material is approximately 40% resin and 60% cotton mat filler. The impregnated sheets are then stacked until the desired thickness has been reached and pressed under heat to a solid slab, 36 by 36 in. in size.

The laminate is produced in two colors—black and natural. When adapting the material to the golf club heads, the black sheet stock is first sawed into strips measuring 2 by 36 in.; the natural-colored material is cut into ½- by 36-in. strips. A ½-in. slot is then milled out of the black strip and, after applying adhesive, the ½-in. wide natural strip is inserted into the milled slot. The combination is then returned to the presses for bonding.

On receiving the bonded combination strip, Bailey & Izett, using standard tools, machines it into wedge-shaped pieces which are fitted into the golf club faces. According to company spokesmen, the craftsmen found the phenolic laminate easier to machine for precision fitting than the materials that had been previously used.

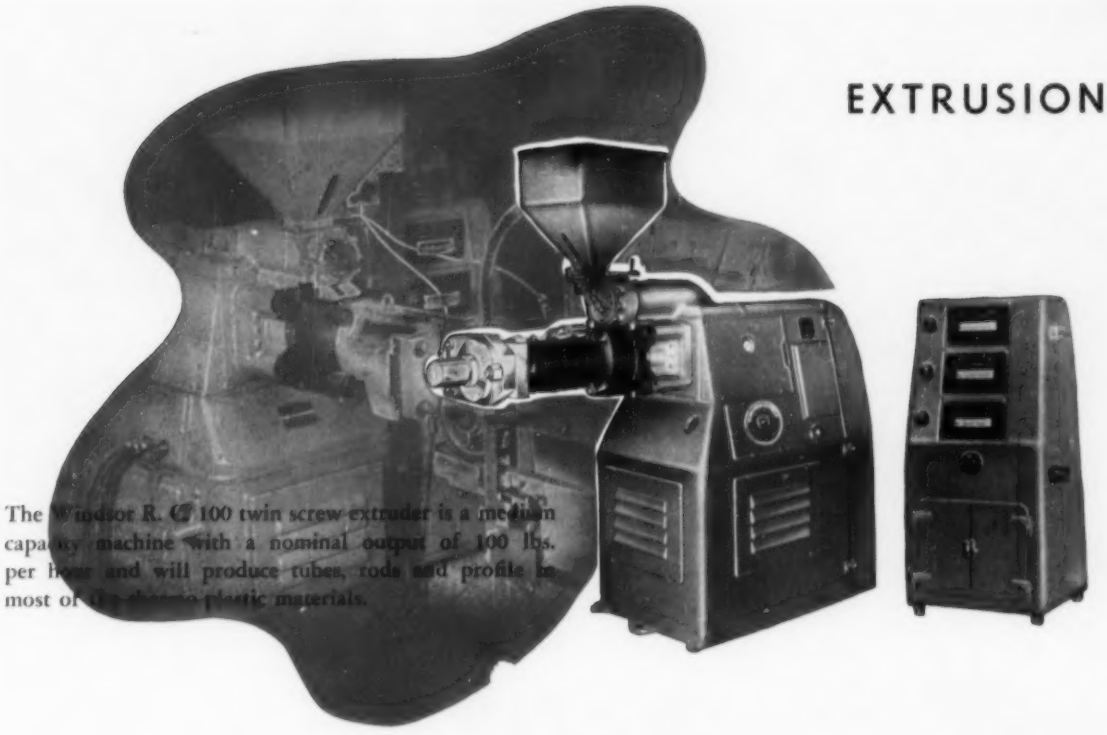
CREDITS: Synthane Grade LRF phenolic laminate is a product of Synthane Corp., Oaks, Pa.

Tough phenolic laminate is used as insert for impact surfaces of golf clubs



Wedge-shaped insert (bottom, left) is cut from combination strip of laminate (top) made by bonding two strips together (cross-section, bottom, right)

EXTRUSION



The Windsor R. C. 100 twin screw extruder is a medium capacity machine with a nominal output of 100 lbs. per hour and will produce tubes, rods and profile in most of the thermo-plastic materials.

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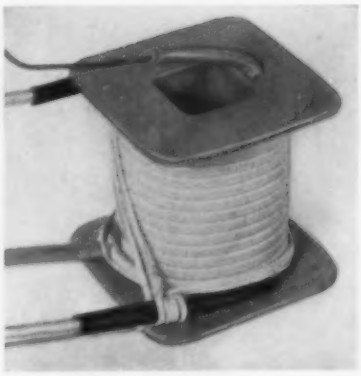


Reinforced plastics bobbin, molded in one piece, replaces 3-piece assembly

One-Piece Bobbins

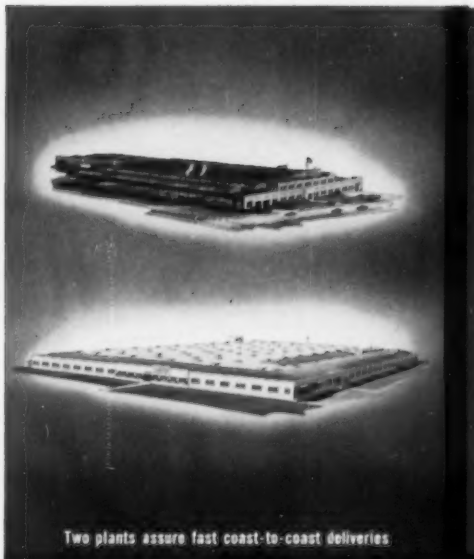
BY MOLDING a coil bobbin of reinforced plastics in one piece, Le-Tourneau-Westinghouse Co. has effected savings of 36% in the manufacture of coils for transformers used in a 300-v. a.c. electrical system powering an induction motor.

A three-piece canvas-phenolic laminate assembly made up of flanges blanked from sheet and cores sawed to length from molded rectangular tubing was formerly used. Bonded together with heat-setting resins, however, the assembly proved too fragile on the production line. Rough handling would frequently loosen the flanges or, under the pressure of winding, they would occasionally bulge or break loose.

In contrast, the one-piece molded polyester-fibrous glass laminate unit provided more than adequate impact strength for the job and made it possible to reduce the thickness of the bobbin flanges from $\frac{1}{8}$ to $\frac{3}{32}$ inch. This reduction represented not only a saving in materials, but allowed an extra $\frac{1}{16}$ in. of clearance between flanges that enabled operators to produce the layer-wound coils faster and with less trouble on the last turn of each layer.

The molded reinforced plastic bodies were also found to provide superior heat resistance over the original assembly. A further saving was obtained in the elimination of the mica sheet formerly wrapped around the phenolic core to insulate the joints against current leakage.

CREDITS: Polyester-fibrous glass premix for molding supplied by The Glastic Corp., South Euclid, Ohio.



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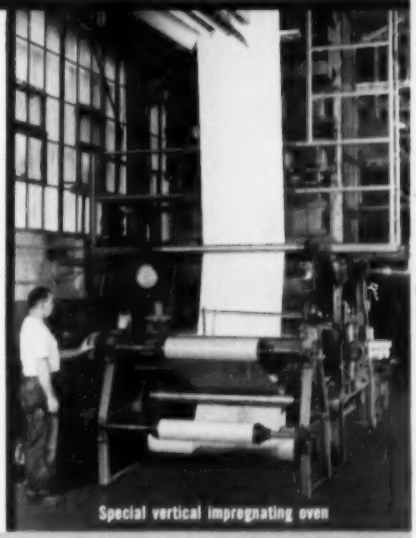

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Vinyl sheeting makes

Better Basket

RICHLY embossed vinyl sheet coverings transform metal wastebaskets from an undecorative, but necessary, household accessory into a high-fashion item styled to blend with modern interior decor.

The colorful coverings, which are available in six 3-dimensional texture patterns and in a like number of colors, are applied completely around the baskets, leaving only a thin metal rim exposed at the top and bottom.

In addition to its value as a decorative element, the vinyl covering serves a highly functional purpose as well. It can easily be cleaned by simply wiping it with a damp cloth and, unlike fabric coverings, will not scratch, fray, or unravel even when roughly used. It further protects the exterior of the metal basket from exposure and hides any unsightly rust spots that might develop.

Because of the resiliency of the deeply embossed covering, any possibility of the basket scratching or marring furniture is eliminated.

The covering is currently being used on a 12-qt. straight oval basket with a gold-colored interior. It is available in corde, faille, nailhead, braided rope, bubble bead, and diamond leather textures and in a choice of green, red, turquoise, black, pink, or brown.

CREDITS: The vinyl covered baskets are manufactured by Hedwin Corp., Baltimore, Md., using vinyl supplied by B. F. Goodrich Chemical Co.

Metal wastebasket is covered with embossed decorative vinyl sheeting

Big Market

(*From pp.* 85-89)

to facilitate adhesion. When viewed from the wearing or top surface, the color lies beneath the vinyl sheet where it is protected against scratching, scuffing, or staining. Kalistron is available in 33 standard colors.

Also in the heavy-gage category is Goodyear's all-vinyl wall tile, a modified version of the company's successful floor tile.

Coated Wallpaper

Vinyl-coated wallpapers are relative newcomers to the field but have already managed to arouse considerable enthusiasm. Imperial Paper and Color Corp., Glens Falls, N. Y., and United Wallpaper, Inc., Chicago, Ill. —two of the "big names" in the wallpaper field—are among the successful producers.

For some time now, paint sales have been making serious inroads on wallpaper sales. Now, with emphasis being placed on "washable" vinyl-coated materials, the wallpaper industry feels that it has found the perfect answer. Thanks to vinyl, this year's sales of wallpaper are expected to swing upwards—and the industry is currently planning a promotional campaign that will acquaint consumers with the advantages that vinyl imparts to their products.

At present, vinyl-coated materials account for only 10% of United's wallpaper production, but the percentage is expected to rise sharply within the next five years.

United's vinyl wallpapers are reverse-roll coated with either a solvent- or emulsion-type vinyl, depending on the grade being produced. Since each roll of material must exactly color-match with every other roll produced, quality control is of the highest importance. According to United, many years were spent in developing the exact formulation of the vinyl coating, including the selection of the proper plasticizer to prevent blooming of the color and the selection of the proper anti-blocking and defoaming agents.

Self-Applied Coverings

Although the self-applied materials are the youngest members of the infant vinyl wall covering industry, the air around them is already blue with claims and counterclaims.

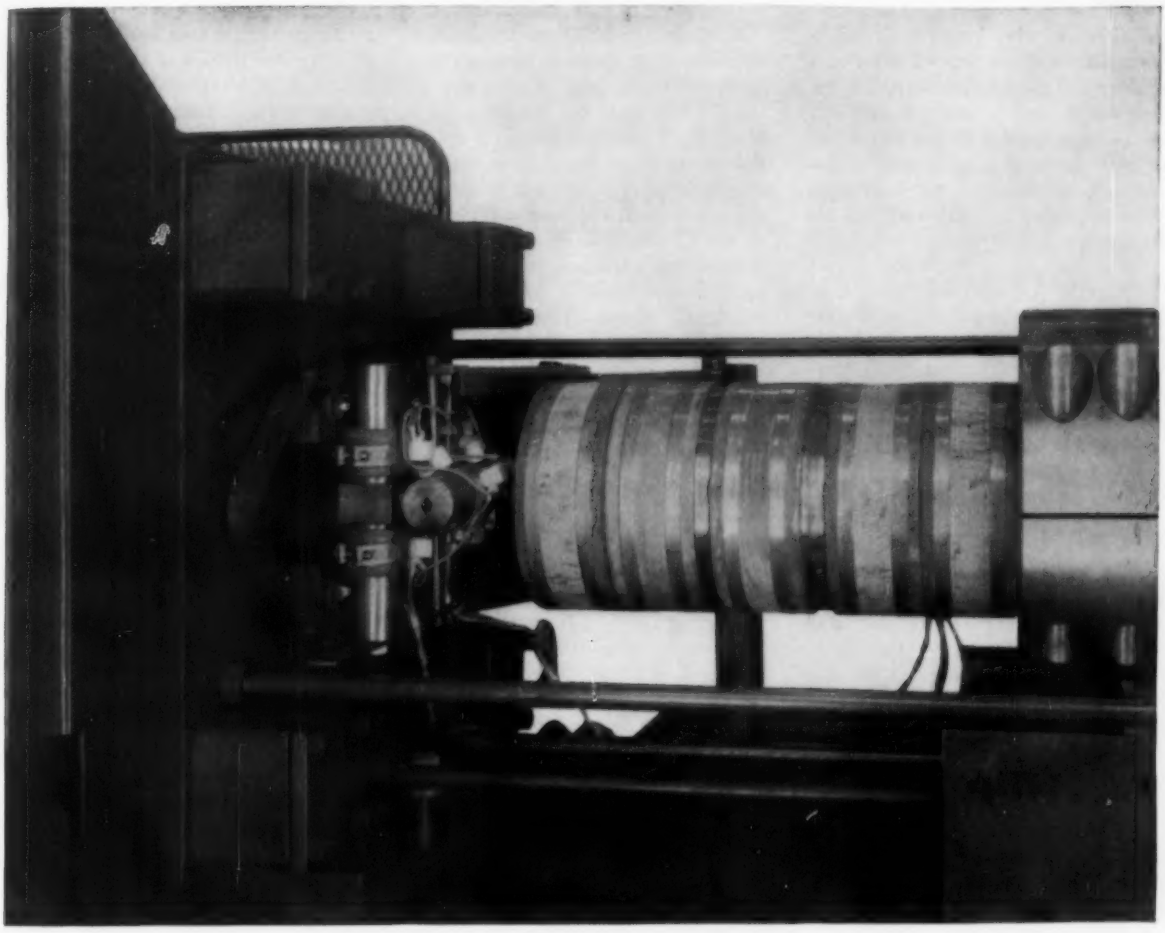
Since most of these coverings are based on unsupported vinyl film and sheeting, many people in the wall covering industry feel that the factor of inherent shrinkage is going to be a tough one to overcome—although nearly everyone agrees that as a decorator material for small surface areas, such as table tops, lamp shades, etc., the self-applied coverings are superb.

On the other hand, the manufacturers of self-applied coverings claim that pressure-sensitive adhesives have been sufficiently perfected to overcome the shrinkage factor and that if the wall coverings are put up properly (with ample overlap), a permanent installation will result. And to bear out their claims, the manufacturers point to the fact that instead of dying as a fad (as some people had predicted), the idea of self-applied vinyl wall coverings has started to snowball. In just the past few months, a large number of companies have announced their entry into the field.

The argument seems to boil down to the fact that, no matter what anyone says, there are still some bugs to be ironed out, but that once they have been overcome, the combination of vinyl's advantages with the ease of installation of the covering will prove an irresistible lure to the do-it-yourself consumer.

Included among the companies already in the field with a vinyl wall covering backed with a pressure-sensitive adhesive are the following:

Cohn-Hall-Marx Co. with Con-Tact wall coverings based on Monsanto's Ultron vinyl film; Bolta Products, Inc., Div. General Tire & Rubber Co., with Decor-Eze self-adhesive decorator vinyl; Harte & Co., Inc., with Quilted Hartex, consisting of two sheets of vinyl padded with fabric and electronically heat-sealed in a diamond-shaped pattern to give a quilted effect; American Home Div., Goodren Products Corp., with a self-adhering vinyl based on Goodyear's film that will be prepackaged for retail sales at neighborhood hardware stores, supermarkets, drug stores, variety stores, etc.; Kimberly-Clark Corp., with Marvalon Adhesive Veneer consisting of a vinyl coating on a cellulose fiber-latex backing (a construction claimed to overcome the inherent



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shrinkage of vinyl) and designed to complement their line of shelf and drawer linings; and Laminated Plas-Tex Corp., with a laminate material in tile form (10 by 10 in.) consisting of two sheets of 10-mil vinyl (supplied by Bakelite Co.) laminated with decorator materials locked in-between.

Miscellaneous Coverings

This year has also seen vinyl start to break into the wall covering market in combination with materials other than conventional fabrics or paper.

One of the most unusual of these is a vinyl-metal laminate being produced by Clad-Rex Steel Co., Denver, Colo., for wainscoting in hospitals, hotels, schools, etc.; for kitchen walls; for partitions in offices and public buildings; etc. The laminate can easily be applied quickly and permanently to most solid surfaces. One unusual application for the laminate has been the design of a completely decorated wall surface for offices that can be used to display various maps and charts held on the wall by magnets.

Another combination introduced only this year is vinyl-fibrous glass laminate wallpaper. A product of Hess, Goldsmith & Co., Inc., New York, N. Y., the wallpaper is available in four patterns: 1) striated—in which parallel strands of fibrous glass grouped together to give a three-dimensional effect are laid on a vinyl-coated paper, and are then knife-coated with a top layer of vinyl; 2) ratine—a decorative material made in the same manner as striated, only with the fibrous glass arranged to give a bouclé effect; 3) Glascloth—in which a woven fibrous glass cloth is first treated with a vinyl-base finish designed to bind the fibers together, to pigment them, and to impart washability, and is then laminated to a vinyl-coated paper; and 4) Glasilk—treated in the same manner as Glascloth and consisting of a finely woven fibrous glass cloth representing a decorator-type silk material. These wallpapers reportedly can be applied using regulation wallpaper paste.

Still another type of wall covering representing a definite innovation is made up of sheets of rigid vinyl vacuum formed into realistic three-dimensional brick and stone patterns by National Vacuum Molding Corp., Yonkers, N. Y., using sheet based on Goodrich's Geon vinyl resins and supplied by Nixon Nitration Works, Nixon, N. J. Called Decro-Wall, the 2- by 4-ft. sheets can easily be cemented to walls using a special paste supplied by the company. (See "Wall Covering," MODERN PLASTICS *32*, 179, July 1955.)

Although the formed sheets have been on the market only a few months, the company reports good consumer reaction. Plans call for expanding the line in the near future to include other formed textured surfaces, such as pebbles, rocks, stones, shingles, etc. Exactly how big a market exists for coverings of these types is still a question—but the industry is watching the application carefully.

Market Problems

As each of the companies in the field can testify, getting their product ready for market has been a major job. Strict requirements on the part of architects and decorators,

for example, call for a strong, quick-tack adhesive to overcome the inherent shrinkage of vinyl and to insure a permanent seam-tight installation, especially in the case of those coverings based on unsupported heavy sheet. Coated fabrics and light-gage sheetings or films hang readily with the usual wall covering adhesives.

The formulation of adhesives is tricky. Most of those on the market today are the result of much research and have been designed specifically for a particular type of wall covering. One manufacturer, for example, reports success with a polyvinyl acetate emulsion-based adhesive; another, with a different grade and quality of covering, claims best results with a synthetic rubber-based adhesive.

Pressure-sensitive adhesives present a particular problem. The Avery Paper Co., Painesville, Ohio, specialists in vinyl film backed with this type of adhesive, report that it is difficult to predict results. The ideal pressure-sensitive adhesive must combine sufficient slip to enable the wall covering to be moved around or removed and enough tack to prevent the film from curling away on the overlap.

Considerable time and research have also been spent on the development of the paper backing which is peeled away from the pressure-sensitive adhesive just before the wall covering is applied. Most of these papers are coated with silicone, alkyd, or similar plastics resins that exhibit a negative reaction to the adhesive polymer.

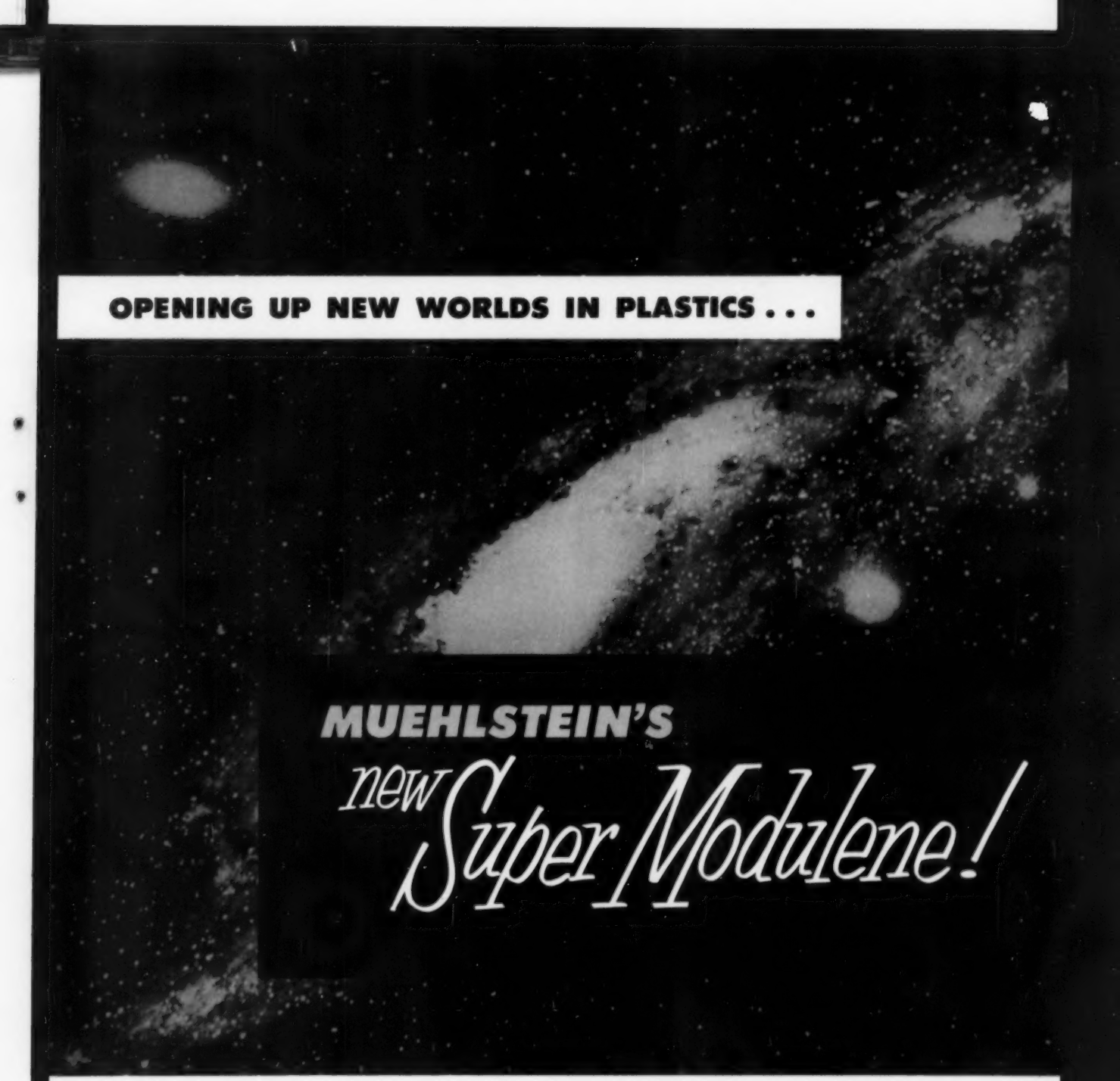
Other technical problems: the formulation of a vinyl that will exhibit all the characteristics of a quality wall covering, yet will be compatible with the adhesive, and the dissemination of proper instructions to the mechanic so that he will know exactly how and where to use the particular wall covering. Some coverings cannot be applied to walls with porous surfaces; others can be applied to almost any type of wall.

The Future

Although the market is already crowded with a variety of vinyl wall coverings, others are still on the horizon. L. E. Carpenter is currently experimenting with a resilient-type covering consisting of a vinyl-coated fabric backed with a layer of vinyl foam. And United Wallpaper is planning to introduce at the end of this year vinyl-coated wallpapers with matching vinyl-coated upholstery fabrics. Since the fabrics are deep embossed, United has developed a technique for embossing the papers in matching textures.

Also in the works is another embossed vinyl-coated paper, 7 mils thick, with a pressure-sensitive adhesive backing.

In the light of all the research still being done, it is obvious that the peak years and the ensuing leveling-off period for vinyl wall coverings are still quite a long ways off. Perhaps the recent entry into the field of manufacturers of conventional wall coverings, with their large budgets and established distribution set-ups, may serve to accelerate its arrival. At any rate, vinyl wall coverings are here to stay —and, properly handled, their reign should be a long and a profitable one.—END



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Biggest Thing

(*From pp.* 98-99)

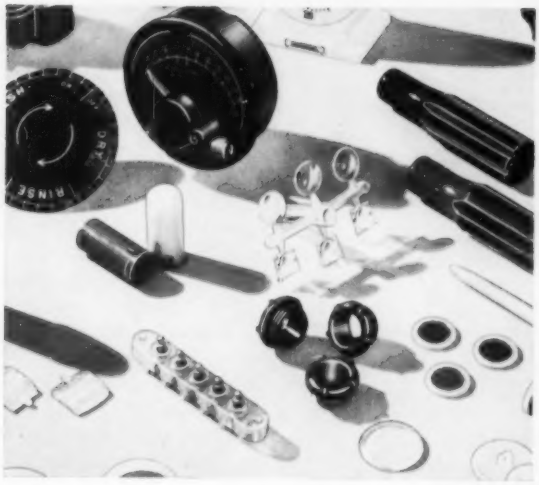
and it is fervently seconded by military authorities who require light weight in strong structures—has been to achieve an all-plastic geodesic structure. Two small pilot structures of this type were built some time ago, one by Geodesics, Inc., and another, for that company, by Universal Molded Products Corp., Bristol, Va. Now, a reinforced plastic structure as high as a four-story building, constructed at the direction of Geodesics' engineers and with its components molded by Lunn Laminates, Inc., has been completed and successfully tested.

The dome is 7/10 of a sphere, 55 ft. in diameter, and 38.5 ft. high. It is the biggest thing yet made of any plastic and is designed to be used by the military as an easily transportable universal shelter. The building was designed for 200-m.p.h. wind stresses, for arctic snow loads, for extreme cold and heat—in short, for any environment. It encloses a volume greater than that of three large eight-room modern dwellings, yet in its first experimental erection was assembled in 288 man-hours by a crew of eight men.

The structure contains 361 reinforced plastic components, 86 of which are circular "hubs," 40 of which are base parts for connecting to a concrete base, and 235 of which are diamond-shaped units which form the great circles for geodesic structure. Total weight of the plastics components is six tons.

Each component is flanged and has a special neoprene-type gasket produced by Pawling Rubber Co. While the assembly of the first structure was accomplished by bolts and nuts, future domes to be delivered to the military will be assembled by patented plastic fasteners made from epoxy laminates.

The molds in which the parts were produced were cast from fibrous glass-reinforced epoxy resins. Mat used in the dome panels was heavy grade produced by Owens-Corning Fiberglas Corp. Hetron 92 flame-resistant transparent resin was used throughout. In the production of the molds, wood patterns were sprayed with furan resin to seal the porosity prior to the application of the epoxy resin.—END



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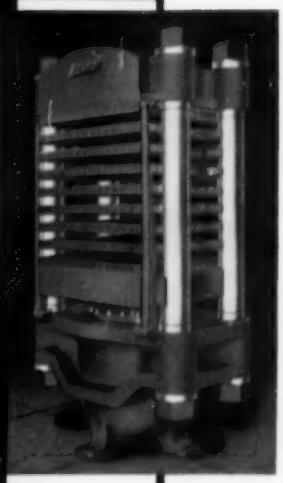

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Polyethylene

(*From pp.* 100-104)

size strips for many purposes. The producer is secretive about the operation, but it is known that large quantities are being used for pipe wrap to prevent underground corrosion and that other quantities are going into electrical, medical, utility, and decorative tape.

Vacuum Forming

Polyethylene film and sheeting for vacuum forming is still in the development stage. More precise heat control is needed for this purpose than with most other thermoplastics. In a vacuum former, polyethylene requires long heating and cooling cycles. If not heated for a comparatively long time, it shrinks too much; if not cooled enough, there will be excessive warping.

A successful package, however, has been produced from 20-mil sheeting for cottage cheese where other thermoplastics are not suitable. The moist cheese gives a certain amount of rigidity to the package and thus overcomes the flexibility of the polyethylene. An experimental package for filets of frozen fish is being tried and could possibly be the forerunner of many more. The food industry needs shaped, flexible packages for frozen foods and vacuum formed polyethylene may be the answer.

Vacuum formers say that polyethylene needs better clarity, more rigidity, and an easier printing surface. All of these improvements are on the way. When they are achieved, huge outlets will open up.

Film Clarity

Improvements in the film itself, resulting from changes in polymerization technique and treatment of the finished film, are already well advanced. From the very beginning, polyethylene has always been milky white or frosty in appearance. It could be made clear, but any such film would always block or stick to itself. Efforts to produce a satisfactory clear film have never ceased and achievement now seems close at hand. An outstanding packaging expert says that lack of transparency in polyethylene will be a thing of the past by the end of 1955.

Whether or not this result will be achieved by the high-pressure resin producers is uncertain, but they have certainly made big strides toward that end in the past year. Perhaps a blend of high- and low-pressure polyethylene will solve the riddle at some future time. Low-pressure producers think they can do it eventually without a blend. They are positive they can prevent blocking, but low-pressure film is a quite different material than high-pressure film and may lack other properties that are quite essential to good film.

The immediate answer to clear film production is mechanical treatment or some type of coating. Plax Corp. is already producing fair amounts of mechanically treated clear polyethylene film. Several other firms are working on coatings. A saran-coated polyethylene film, for example, is almost as clear as crystal.

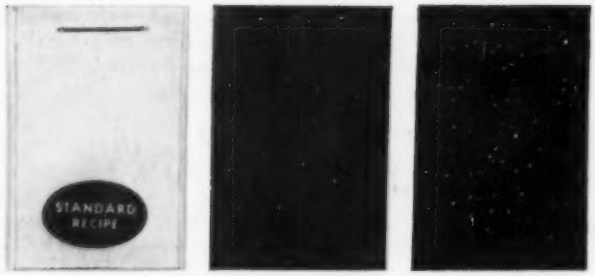
Coated Film

The business of coating polyethylene film with other resins, lacquers, or chemicals seems almost broad enough to result in a whole new branch of enterprise. This technique, which should not be confused with coating other materials, such as paper, with polyethylene, is, of course, only a surface treatment. Conventional polyethylene film surface scatters light, but when the proper coating is applied, the surface appearance is improved.

The three types of surface treatment for polyethylene are: 1) chemical, electrical, and thermal; 2) application of additives which can be used in quench water or sprayed on; and 3) continuous coating with some desirable resin.

The big future expected for coated polyethylene revolves around other factors than just better clarity. When the surface is improved, the film becomes more utilitarian. Its properties are improved in many ways. Not only is surface haze reduced, but it may also be possible to improve surface slip. Gas and water vapor permeability may be modified. Even the printing surface may be benefitted and a better surface to grip adhesives could be developed.

Thick polyethylene sheeting up to 60 mils is now readily available and seeking new markets. So far it has been used principally for corrosion-resistant containers either alone or



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	Admex 710	Admex 711	Admex 744
Acid Value (Max)	0.3	0.3	1.0
Color (Gardner) (Max)	2.0	2.0	3.0
Viscosity @ 25° C (Stokes Approx.)	3.9	4.5	0.5
Refractive Index (Approx.)	1.471	1.472	1.4512
Specific Gravity @ 25° C. (Approx.)	0.991	0.998	0.909
Lbs. per gallon (Approx.)	8.25	8.31	7.56

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as a liner. Producers believe that big markets are awaiting only the ingeniousness of processors in finding satisfactory markets.

Molding Material

Polyethylene molding material is expected to show an even greater ratio of growth in 1955 than film and sheeting. The biggest portion will be used for housewares. That outlet has been so big that molders haven't taken much time to develop other markets. The ceiling for polyethylene housewares is thought to be in the 50 to 60 million-lb. range. When that point is reached, molders will have to start looking to other fields. They are expecting that the low-pressure polyethylenes will aid them in broadening their base because the material is stiffer and has a higher heat resistance.

However, there is no tendency to write off the versatility of conventional polyethylene molding material. There are many places where its flexibility may be a more desirable property than stiffness. There is also a likelihood that molds will not always be interchangeable between low- and high-pressure polyethylene materials.

Predictions as to the effect of polyethylene moldings on other thermoplastics are still premature. The low-pressure and some conventional polyethylenes will undoubtedly be used in certain large moldings; they will also go into toys, into certain types of closures where the low yield of polyethylene is not a drawback, into pipe fittings, and into many industrial applications. But so far, molded polyethylene has been largely used for housewares and toys. The future is not so clearly discernible as it is for film, but there is no tendency to put a limit on the amount that can be sold for molding purposes in future years. Much depends upon how well the new stiffer and more heat resistant materials perform.

An outstanding incident of what's going on in this ever-changing industry was the introduction by Eastman Chemical of its new melt-index 20 material, which is notable for its fast flow in the mold, rapid molding cycle, and glossy finish on the molded part. This particular formulation has been popular in England for some time. Producers in the United States were aware of this but

were somewhat doubtful about its practicality, and had been so busy meeting the demand for and improving their other formulations that they never got around to it until Eastman made such a big splash. The material is especially useful for large items such as waste baskets. Other producers are now working on similar formulations which they claim will have all the advantages of fast molding and gloss finish without sacrifice of other properties.

Spheroid Pellets

Eastman is also the sole producer of spheroid pellets which it claims are easier to handle and will save storage space. The firm now has trucks equipped to handle bulk shipments from which the pellets can be air-veyed to customers' bins or tanks. The molder can then air-vey direct to the molding machines.

Melt index, mentioned above, is a subject of considerable discussion in the industry. Because of confused knowledge on the subject it was seldom mentioned outside producers' plants until U.S.I. came out with their assurance to customers that their resin deliveries would have a uniform melt index. The term is a measure of plastic flow under certain specific standard conditions. The problem in using the term comparatively is that commercial processing is almost never carried out under the specified conditions.

In some ways it is a misleading measure of quality and as difficult to pin down as molecular weight, which is food that only chemists can digest.

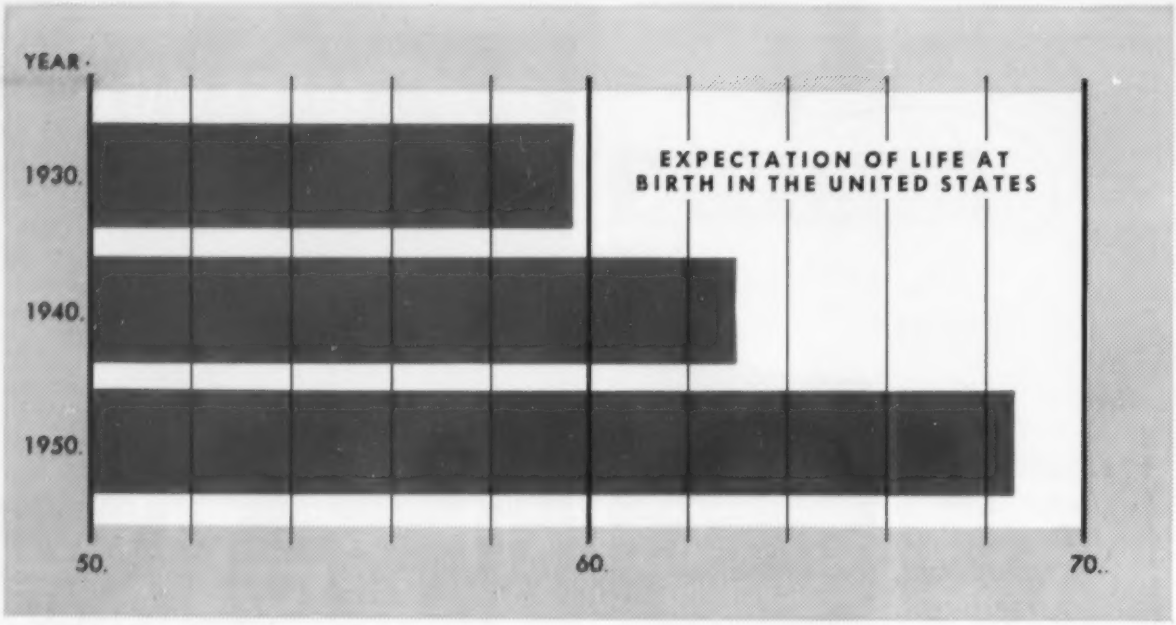
Molecular Weight

Every company differs in its balancing of molecular weights in a given formulation. Some use a weight balance, others use a number balance. Most of the molecular weights today vary from 18,000 to 25,000. The higher the molecular weight, the lower the melt index. A melt index of 2 might be a weight average of 19,000 and a number average of 32,000. A melt index of 20, might mean a molecular weight of 15,000 or 16,000.

Bottles

Blow molded bottles are listed separately from injection molded polyethylene in this article because bottle molding is a quite different

(*To page* 233)



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INJECTION PRESSES. Illustrated brochure contains detailed specifications of the "New Lombard" 12- and 16-ounce injection molding machine. Machine features centralized hydraulic control panel for simplified inspection and maintenance. Lombard Governor Corp. (J-501)

HEATING CYLINDERS. Catalog describes company's line of replacement cylinders, heater bands and adapters for all makes of injection presses. Detailed instructions on installation, operation, and maintenance of superheaters is included. Injection Molders Supply Co. (J-502)

PLASTICS COLOR GUIDE. Bulletin evaluates consumer color trends in in housewares as determined by sales records, and presents 18 recommended colors, with suggested applications for their use with specific kinds of products. Monsanto Chemical Co. (J-503)

PLASTIC CYLINDER FABRICATOR AND BEADER. Brochure gives detailed description and specifications of machines for fabricating and automatically beading plastic cylinders. Price list included. Taber Instrument Corp. (J-504)

AUTOMATIC HYDRAULIC PRESSES. Specifications sheet gives details on three new molding presses for handling thermosetting materials. Details given include platen area, stroke, closure speed, etc. Plastic Press Division, Baker Brothers, Inc. (J-505)

NYLON COST CALCULATING. Folder provides information to help calculate material cost of nylon part for comparison purposes. Costs are determined by part's volume in cubic inches. Typical example shows how proper part design yields savings. Nylon Molded Products Corp. (J-506)

EQUIPMENT FOR FOAMED MATERIALS. Catalog sheets describe company's line of splitters and roller die cutters, expressly designed for the handling of synthetic foamed materials and foam rubber. Specifications and floor plans included. The Falls Engineering and Machine Company. (J-507)

DRY COLORING. Folder suggests procedures and equipment to be used in the dry coloring of molding compounds. Information on company's line of colorants and dispersants is included. Plastics Color Co. (J-508)

PLASTICS WELDING. House organ contains technical data on hot gas welding and on "Agiline-HT," a processed polyethylene with high tensile strength and heat resistance. American Agile Corp. (J-509)

ROTARY SAW BLADE. Folder describes rotary saw blade suitable for high-speed cutting of all types of plastics sheet and laminate stock. Blades, available in diameters from 8 inches to 16 inches, feature reinforced tips for long wear. Radial Cutter Mfg. Corp. (J-510)

HYDRAULIC EQUIPMENT. Text, engineering drawings, and specification tables of this booklet combine in depicting company's line of hydraulic valves and associated cycle controlling devices. The Sinclair-Collins Valve Company. (J-511)

COLORS FOR VINYLS. Literature gives general information on the technique of coloring vinyls for calendering, extrusion, and molding. Compares dry colors vs. color concentrates, and lists dry colors supplied by company. Ferro Corp. (J-512)

WEB EDGE POSITON CONTROL. Bulletin describes mechanism for controlling the edge position of plastic film and sheeting webs. Askania Regulator Co. (J-513)

HEATER COILS FOR VACUUM METALIZING. Folder gives detailed description of line of tungsten coils and strands, including performance nomographs and guide table for the high vacuum evaporation of metals. Sylvania Electric Products, Inc. (J-514)

IMPACT TESTING INSTRUMENT. Folder gives information about Izod and Charpy impact tester for plastic materials with a testing range from zero to 30 foot pounds. National Forge and Ordnance Co. (J-515)

INJECTION MOLDING PRESS. Literature describes operation and offers detailed specifications of the Moslo Model 75-8¾ oz. horizontal, automatic injection machine capable of 700 cycles per hour. Prices of press and available accessory equipment are included. Moslo Machinery Co. (J-516)

FASTENING ANALYSIS SERVICE. Folder describes service that provides "no-obligation" analysis of any products using fasteners. Analysis includes general product diagnosis, detailed recommendations, and sketches of each suggested application. Tinnerman Products, Inc. (J-517)

WHEN TO SPECIFY IMPACT THERMOSETTING PLASTICS. Reprint discusses basic resins and fillers, desired properties, standard military impact designations, use of impact materials, design considerations, finishing of molded parts, cementing, and coatings. Fiberite Corp. (J-518)

HIGH-IMPACT POLYSTYRENE. Folder describes "Kleestron H": its properties and characteristics in molding, extruding, and finishing; its color range; its differences from other polystyrenes. Kleestron Ltd. (J-519)

ELECTRIC MOTORS. Literature describes "Klosd" and "Klosd-Tite" electric power drives, including drip-proof, splash-proof, totally enclosed fan-cooled, and totally enclosed non-ventilated types. Specifications, dimensions, performance data included. Sterling Electric Motors. (J-520)

POLYESTER RESINS. Handbook gives complete description of characteristics, specifications, and applications of the "Glidpol" line of polyester resins. The applications described include molding, laminating, casting, impregnating, and surface coating. The Glidden Co. (J-521)

LABORATORY EXTRUDER. Data sheet gives details on new 1¼" extruder for test work, with length/diameter ratio of 20 to 1, screw speeds from 10 to 160 rpm. Robbins Plastic Machinery Corp. (J-522)

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ADHESIVES FOR BONDING THERMOSETTING PLASTICS. Brochure describes, lists prices for line of 13 epoxy resin adhesives and activators, suitable for bonding thermosetting plastics. Armstrong Products Co. (J-523)

WASHING MACHINE FOR SHEET PLASTICS. Literature describes, gives specifications for line of automatic washing-drying machines that can wash both sides of continuous lengths or individual pieces of plastics sheet in widths from 12 to 80 inches. Sommer & Maca Glass Machinery Co. (J-524)

HAND SEALER FOR THERMOPLASTIC FILMS. Literature describes simple hand sealer that flat-seals straight or irregular shapes of light-gage thermoplastic films; also seals cellophane. Sealine Mfg. Corp. (J-525)

INJECTION MOLDING PRESS. Illustrated folder describes 4-ounce injection molding machine that features injection pressures up to 20,000 psi. Fully automatic unit will accommodate molds as large as 13½ by 22 inches. The Lewis Welding and Engineering Corporation. (J-526)

VACUUM COATERS. Illustrated data sheets provide detailed description and specifications for three vacuum coaters with chamber diameters of 18, 30 and 48 inches. Consolidated Vacuum Corporation. (J-527)

HYDRAULIC PRESSES. Booklet pictures typical examples of this company's giant-size hydraulic presses used in the manufacture of laminated plastics. Units with pressures up to 5,000 tons and platen areas as large as 100 by 52 inches are described. Fjellman-American, Inc. (J-528)

ELECTRIC OVENS. Illustrated data sheet offers dimensions, capacities, special features of line of portable two-door, high-temperature electric ovens and of an 8-drawer unit controllable up to 325° F. Crieve-Hendry Co., Inc. (J-529)

MOLD MAKING. Illustrated brochure traces the growth, describes facilities and personnel of company specializing in production of metal molds for laminated plastic molding and wood and metal patterns. Engelking Patterns, Inc. (J-530)

SMALL INJECTION PRESSES. Catalog describes line of three-quarter ounce vertical injection molding machines for school, laboratory, sampling and production use. Specifications, prices, dimensions included. Newbury Industries. (J-531)

PLASTISOL BASE. Technical manual describes "Pliovic AO," a vinyl chloride copolymer dispersion resin used as a plastisol base. Gives data on compounding, processing, forming, slush molding, etc. Goodyear Tire and Rubber Company. (J-532)

SPRAY MASK EQUIPMENT. Illustrated data sheet describes portable spray mask washing machine, air operated, with an effective cleaning area of ten by ten inches. Sepanski & Associates. (J-533)

PRE-HEATER FOR ROTARY PRESSES. Illustrated data sheet describes operation and gives specifications of unit that pre-heats, pre-forms and feeds to rotary presses automatically. W. T. LaRose & Associates, Inc. (J-534)

PAINTS FOR PLASTICS. Catalog sheets give properties, available colors, uses, and instructions for line of metallic and non-metallic paints for plastics. Logo, Inc. (J-535)

PLASTICS GRANULATOR. Illustrated data sheet describes company's Model "A" caster-mounted unit with throat size of four by eight inches, featuring an automatic hopper loader. Thoreson-McCosh, Inc. (J-536)

TOOLING PLASTICS. Manual, "How To Use Ren-ite," provides step-by-step instructions on the use of these liquid thermosetting resins in building plastic models, fixtures, and other tooling. Ren-ite Plastics, Inc. (J-537)

HIGH-IMPACT SHEET STOCK. Folder gives details about "Gilco" high-impact polystyrene sheet for vacuum forming and fabricating. Company's development service for fabricators is also described. The Gilman Brothers Company. (J-538)

PLASTICS INSULATION. 24-page design manual gives properties, design data, machining tips and applications for mycalex, a compression moldable insulating material formulated with ground mica and a special glass. General Electric. (J-539)

STABILIZERS. Technical catalog describes line of general and special-purpose stabilizers, giving for each recommended uses, properties, and recommended basic formulations. Argus Chemical Corporation. (J-540)

HOT PLATE PRESSES. Catalog describes company's extensive line of low and high pressure platen presses for plastics laminating. Details on press construction, hydraulic systems, dimensions and capacities are included. Berthelsen Engineering Works, Inc. (J-541)

MOLD BASE ASSEMBLIES. Illustrated data sheet provides complete description, specifications and prices of a line of mold bases with thicknesses up to 1¾ inches for each plate. Bases are equipped with sprue bushings and knockout mechanisms. Drawings provide all necessary engineering data. The Van Dorn Iron Works Company. (J-542)

LAMINATING RESINS. Technical manual gives details on "Araldite 502," a modified epoxy resin especially suited to laminating by methods requiring contact pressure only. Properties, mold preparation, mixing procedures and curing data are included. Ciba Company, Inc. (J-543)

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operation, and in most cases a special formulation is required. The business is growing conservatively because polyethylene bottles can only be used for certain materials, and, therefore, each prospective use must be carefully tested. Polyethylene is also much more expensive than glass.

The new low-pressure polyethylenes will undoubtedly expand the market, but bottle makers were astounded to see the producer's guess of a 100 million lb. market by 1960 in the first installment of this article. Of course, he was counting on invading the soft drink and milk bottle market which he thought might be possible with sterilizable polyethylene bottles that would withstand terrific abuse. A soft-drink glass bottle, for example, averages only six trips—polyethylene should do much better.

One of the best signs of progress in the polyethylene bottle business has been a stabilization of the industry in 1955. The bulk of the business has always been in cosmetics, but there was little from that source in mid-winter. Last winter the pharmaceutical business in plastics bottles got going and took up the slack.

There are only a few big customers for polyethylene bottles—all in the cosmetics or drug field. Use is limited to bottles that contain little or no essential oils or alcohols. There are, of course, some specialty items that take big quantities, such as nursery and catsup bottles.

The nursery bottle, which requires 45 lb. of material for every 1000 bottles made, was distributed at a rate of 1 or 1½ million units a month when it first came out but has now dwindled down to perhaps 200,000 a month. The supply lines eventually filled up and, in addition, there is no profit in it for the molder now that the retail price has dropped to 29 cents. In addition, there was always a fear that it would prejudice housewives against polyethylene because of possible damage to the bottle in sterilizing.

The catsup bottle for table use, requiring 40 lb. of molding material per 1000 bottles, seems to be a natural for polyethylene. This spout-top, 8-oz. bottle was quickly adopted for other condiments. Late last winter sales were reported to be as much as 2 million units a month—they are now down to about 1 million. The bottle sells for from 19 to

25 cents. Molders claim that the price is too low for a profitable operation.

The double-wall jars for cosmetics have not become so universally popular as expected. They require 107 lb. of material per 1000 jars, with 4¢ worth of material for each bottle. Glass jars cost only 2 or 3¢ each. A filled jar of cosmetics that sells for $2.00 can afford polyethylene but, unfortunately, most of the filled jars sell for less than $1.00 and the producers won't use polyethylene at present prices.

Collapsible Tubes

Polyethylene collapsible tubes are moving along in good shape for a product that is brand new. Within a few years time production should reach 3 or 4 million units a month. The total market for metal collapsible tubes is about 900 million units a year, about half of which are for toothpaste. The latter is unsuitable for polyethylene because of the oil content. On the other hand, there are several products that can be carried in polyethylene that are not suitable for metal and some of them are already on the market. Glue, shoe polish, liquid saccharine, finger paints, sun tan lotions, detergents, insecticides, jellies, food pastes, and talcum or foot powders are eligible.

Polyethylene Pipe

Trying to figure out the amount of polyethylene used in pipe with any accuracy is as complex as trying to make a pair of pants for a centipede. A principal point of controversy is how much scrap is used in the industry as compared to virgin resin.

After weighing all the evidence on 1955 forecasts, an educated guess is that somewhere between 25 and 30 million lb. of virgin resin and anywhere from 8 to 12 million lb. of scrap will be used for polyethylene pipe in 1955. Producers estimate that polyethylene pipe consumption will grow to a 70 or 80 million lb. figure within four or five years and then level off. This estimate applies only to flexible, conventional polyethylene. The new high-density rigid polyethylene pipe will add to the base and perhaps add many millions of feet if it proves practical for hot water. It is not likely to compete with conventional polyethylene since a great advantage of the latter is that it can be handled in coils.

The pipe market has been a con-

venient aid to polyethylene producers in disposing of off-grade material which otherwise would be destroyed. Use of scrap material has led to all sorts of complaints concerning poor quality pipe, and pipe distributors fear that it will eventually take over a major portion of the market just as scrap vinyl is claimed to have done in the garden hose market. But raw material producers state that there will never be enough scrap available to meet the total demand for polyethylene pipe.

An important feature of the pipe situation is how much carbon black to use in order to prevent degradation of the polyethylene from sunlight. Even when the pipe is to be buried, use of carbon black is necessary because coils are frequently exposed to sunlight in distributors' storage yards. It is believed that carbon black will extend the life of pipe from 20 to 30 years; without the black, the pipe will deteriorate in less than a year if exposed to sunlight.

Tests indicate that a minimum of 2½ to 3% of carbon black should be used in pipe compounds. Some pipe producers have been trying to get by with less. Furthermore, the black must be in finely divided particles and properly dispersed to obtain complete opacity or it will do no good. Most polyethylene producers sell compounded black material for pipe. Extruders who attempt to cut costs by using inferior compounding equipment, as well as scanty amounts of coarse or inferior carbon black, are likely to produce an inferior grade product. Such pipe has been the curse of the industry in the past and sometimes results in violent prejudices against use of plastic pipe.

Polyethylene pipe is used primarily to carry cold water. It is ideal for conveying chemicals in low-pressure systems where little or no heat is involved, but so far there has been only a mild invasion of that field. Small diameter pipe, 2 in. or less, is by far the biggest portion. Almost no market has been achieved in anything over 4-in. diameter, although 6-in. pipe is available. Most pipe is made to withstand 70-lb. pressure, although some extruders make premium pipe advertised to withstand 100 and 125 pounds.

Something like 80 to 85% of all polyethylene pipe is thought to be

(*To page* 238)

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used for cold water, including waste. Most of it is for jet wells and water lines on farms where pressure isn't too high. In large-scale irrigation systems, the pressure is generally too high for polyethylene.

Other Pipe Uses

Mine drainage pipe gave polyethylene pipe its start in the early 1950's. In this application, scrap polyethylene seems quite acceptable. However, the market has stopped growing. When all the coal mines were equipped with it there was no need for replacement as was the case with metal pipe.

Polyethylene lawn sprinkler systems have been widely heralded, but there is still considerable criticism of their serviceability. One of the largest distributors says that a do-it-yourself system generally requires changing the water main to the house and part of the house piping because 1½ in. pipe is needed to run a sprinkler system; in low-pressure areas an even bigger pipe is required.

Two possible new uses for polyethylene pipe look promising. One is a thin-walled, perforated polyethylene drainage pipe that can be laid from a subsoiler, thus avoiding the need for digging a ditch.

The other is pipe for air conditioning. In a typical cooling tower system, liming causes corrosion of metallic surfaces. Polyethylene is corrosion- and scale-resistant. By 1963 this market could be 60 million ft. or a $5 million market, according to one pipe maker. It exceeds the jet water pump market by 30 million feet.

There are many other possibilities for pipe. Substantial markets in such opposite directions as radiant heating and brine freezing installations are in the offing. There are many untested fields in which use of polyethylene may be practical. In 10 years from now polyethylene pipe usage could be many, many million pounds more than anyone dares to guess now.

It is true that the industry is in a chaotic condition today. There is no unanimity of opinion on proper sizes, testing methods, or general standards. Extruders complain bitterly of less than 5% profits and of chiseling competitors who put low-grade pipe on the market. Here is a 3- or 4-year old industry that already has serious marketing problems; but, neverthe-

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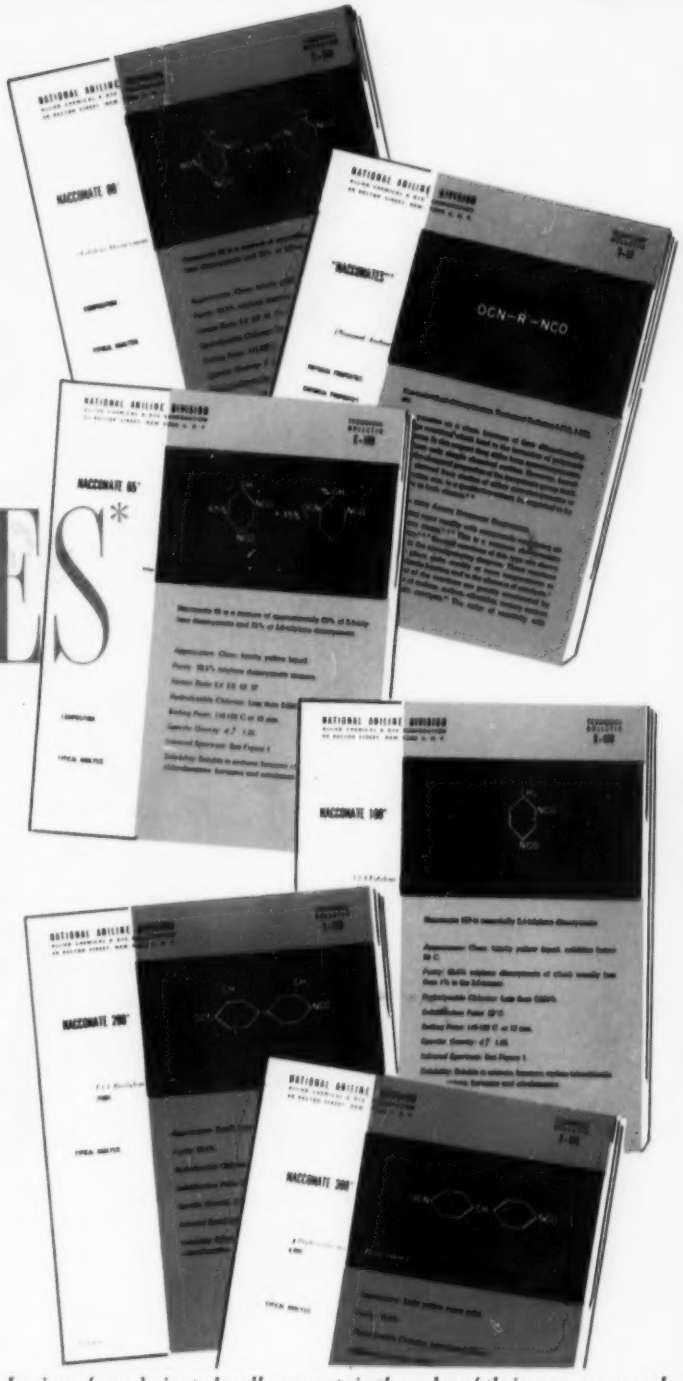

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Bulletin I-17C—NACCONATE 100 gives corresponding product data on National's 2,4-tolylene diisocyanate.

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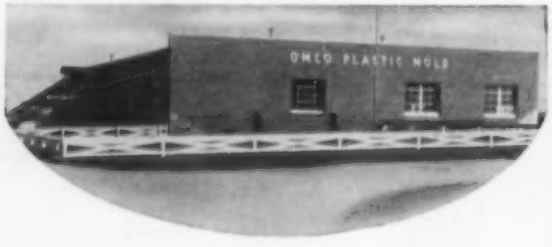

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less, the product has so much to offer that it is bound to progress despite bumbling.

Wire and cable coating and jacketing was the use for which polyethylene was first designed by I.C.I. in England. Without it there would have been no radar and the fighter aircraft history of World War II might have been very different. The British have been particularly active in the development of polyethylene for electrical purposes since the war.

Polyethylene wire coating and jacketing is used for high-frequency and high-voltage wire, TV lead wire, microphone cable, appliance wire, control cable, and telephone line and drop wire. The telephone line wire increase has been phenomenal since it is used for both new installations and replacements. There are thousands of miles of telephone lines to be replaced and it will be a long time before the job is done.

Another big use requiring 5 or 6 million lb. was for the new submarine cables now being laid under the ocean. The British obtained a big portion of this order, but it may become a growing business since telephone cables are being touted as much more satisfactory for overseas communications than radio.

There is at present no indication that polyethylene will supersede vinyl-coated wire for many purposes since its abrasion resistance does not compare with the latter. The high-heat resistance of low-pressure polyethylene, however, may some day make it eligible for use on high-voltage power cables where synthetics have not been generally practical in the past.

Polyethylene for wire coating is 45¢ a lb.—higher than other grades because of special preparation. Practically all wire coating compounds for outdoor use contains 3% of carbon black and anti-oxidants to prevent weathering and to protect low power loss characteristics during molding or extrusion operations.

There are two variations for wire coating material that have not grown much but have possibilities. One is a foamable polyethylene composition which contains a blowing agent. At extrusion temperatures, gas is evolved in the molten polymer which, when cooled, is cellular. Because of the presence of inert gas, the dielectric constant is even lower than that of solid polyethylene. The

other is Rulan, a chlorinated, flame-retardant, electrical-grade polyethylene. The market has been slow in developing probably because of cost.

Paper Coating

Polyethylene for coating on paper has shown a substantial volume growth in the past 18 months. It took a long time to get started after a sensational introduction just before the Korean war but is now well on the way to expanding markets. Its advantages are moisture vapor resistance, heat-sealability, and many other properties that it adds to paper. The process of producing it by a combined extrusion, roller-coating method has been perfected.

The possibilities for expansion of polyethylene-paper combinations are of gigantic proportions. As outlined by H. K. Intemann of Bakelite in a talk before the Specialty Paper and Paperboard Affiliates, some of them are as follows: A coating of polyethylene 0.001 in. thick on only one side of milk cartons could consume about 54 million lb. of polyethylene per year. In addition, it could eliminate the cost of adhesives presently used to seal the cartons; a 0.0005-in. coating on the paper used for 20 billion packages of cigarets sold each year would consume 15 million lb. of polyethylene; a 0.001-in. coating could possibly eliminate the aluminum foil in cigaret packaging; wrappers for chewing gum could consume 1.8 million lb. of polyethylene per year; cereal boxes and other food cartons are potential fields for the application of polyethylene-coated paperboard; paper cups, ice cream cartons, and frozen food cartons, as well as building and roofing papers are potential prospects for polyethylene coatings; polyethylene-coated non-woven paper or fabric bedsheets for hospitals could consume 75 million lb. a year; and diapers of the same material would take another huge amount. And those are only a few possibilities that are considered worth investigation.

Mr. Intemann further pointed out that polyethylene may be coated or laminated to many other materials, such as fabrics, foils, and cellophane, to each of which it brings qualities of extensibility, abrasion-resistance, and resistance to both moisture and moisture vapor transmission.

All the foregoing indicates that the

growth of polyethylene in its present form is assured for a long time to come. But the significant factor is that high-pressure polyethylene resins are being constantly improved and better properties are being built into them to meet requirements for myriads of new uses.

A few years ago, polyethylene was practically a one-formulation material with only a few modifications. For a long time, one producer stuck to the idea that an all-purpose material was the right way to approach the situation. But the competition was producing certain grades that were more favored by the customer. The competition started early to make different polyethylenes for molding, film, and electrical grades, and with modifications of each.

The first producer mentioned changed his approach a year or two ago and now has just about as many different polyethylene formulations as the competition. The change has been so successful that processors comment readily and heartily upon the improvements.

All producers, including the new ones, now admit that polyethylene must virtually be tailor-made to fit the needs for various uses. All of them hope they will never approach the status of the phenolic industry where almost every customer demands a different formulation; but just the same, they are struggling mightily to meet each customer's whims.

Customer's Demands

And the customers are finicky and changeable. Each uses his equipment a little differently. He can make one supplier's formulation do a job for him that another supplier's material won't touch. He may use a film resin for a molding job; he is becoming just as expert in performing different tricks with various resins as his supplier is expert in turning out new and modified formulations.

With all this variety in resin and processing, there is simply no telling what will be coming from extruders and injection machines handling polyethylene in the future. Bakelite has at least 17 major resins and Du Pont has 16, each of them capable of modifications. Eastman and Spencer are well started on the same course. Doubtless the others will follow. Primarily, the various resins are all molding, film, and electrical grade, but formulations for bottles, pipe, housewares, and toys are all separately tailored, even though they are labeled molding resin. Film resins are tailored for different degrees of transparency, softness, flexibility, and lower softening point. Tensile strength varies from 700 to 2200 p.s.i., stiffness from 17,000 to 30,000 p.s.i., softening point from 176 to 208° F.

The low-pressure producers will, of course, add a much greater range to properties, but even if this new process had never been discovered, conventional polyethylenes could be depended upon to provide a never-ending flow of improved materials with which processors could fabricate an almost unbelievable variety of products. The high-pressure producers can use different temperatures, various pressures, and vary their catalyst content in the polymerization process almost as freely as the low-pressure producer. No one can predict just how much better or different their resins will be within the next five years.—END

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Meetings

(*From page* 105)

titative determination of free ammonia in phenolic moldings, and boiling water absorption of plastics.

Five Draft ISO Recommendations have previously been sent to Geneva for distribution, dealing with the determination of percentage of acetone-soluble matter in phenolic moldings, apparent density of molding materials that 1) can and 2) cannot be poured from a funnel, water absorption of plastics, and temperature of deflection under load (heat distortion temperature). Further action on these methods awaits results of international balloting.

Two new Working Groups met for the first time at the Paris meeting. These groups will deal with the preparation of test specimens (leader is Earl Ziegler, U. S., The Dow Chemical Co.) and electrical properties (leader is Mr. Aeschlimann, Switzerland).

The committee voted to cooperate closely with Technical Committee 15 of the International Electrotechnical Commission (IEC/TC 15, which was represented at the meeting by R. I. Martin of Great Britain) in work on the development of international electrical tests for plastics. A similar resolution was adopted relative to cooperation with ISO/TC 5/SC 6, represented at the meeting by D. J. van Wijk (Netherlands) and L. D. Marlier (Belgium), in the preparation of international specifications for plastic pipes and fittings. ISO/TC 61 also voted to revise its scope to include specifications as well as nomenclature and test methods; this action must be approved by the ISO Council.

The delegates and their wives were graciously entertained during the conference by Le Syndicat des Fabricants de Matières Plastiques, L'Union des Syndicats de la Transformation des Matières Plastiques, Le Centre d'Etude des Matières Plastiques, L'Association Française de Normalisation, and the Saint Gobain Co. A reception was held on the opening day at L'Hôtel de Ville (Town Hall), at which the Deputy-Mayor welcomed the delegates to Paris. A banquet at the Pavillon Dauphine on the evening of July 12 was addressed by Prof. Léon Jacqué, President of the Centre d'Etude des Matières Plastiques, and by Dr. G. M. Kline.

D. J. van Wijk, on behalf of the Hoofdcommissie voor de Normalisation in Nederland, invited ISO/TC 61 to meet in the Netherlands in September 1956, probably in Scheveningen.

IUPAC Meeting

The 18th Conference of the International Union of Pure and Applied Chemistry and the 14th Congress, covering organic chemistry, were held in Zurich, Switzerland, July 20 to 28. Over 600 papers were presented, approximately 50% of them in English. Highlighted among the papers relating to high polymers were those by K. Ziegler (Germany) on "Aluminum in Organic Chemistry" and by G. Natta (Italy) on "Synthesis and Structure of Some Crystalline Polyhydrocarbons Containing Asymmetric Carbon Atoms in the Principal Chain."

These two papers dealt with the important new group of commercial

hydrocarbon resins of higher modulus (greater stiffness) than the polyethylene produced by the high-pressure method. By polymerizing the hydrocarbons with surface-active, insoluble catalysts at relatively low temperature and pressure, an oriented arrangement of molecular groups is achieved rather than the random branched pattern that results from homogeneous catalysis (in solution or gaseous media).

Although the polyethylene produced under these new conditions of heterogeneous catalysis has significantly higher modulus and softening point, this development is particularly interesting in opening up the possibility of preparing crystalline polymers from unsymmetrical olefins and vinyl compounds, such as propylene, α-butylene, styrene, and vinyl ethers. Propylene may soon join the growing list of important raw materials for plastics.

Dr. Natta has prepared crystalline olefinic and vinyl polymers with the following melting points:

Polypropylene ..	160 to 170° C.
Poly-α-butylene	125 to 130° C.
Polystyrene	230° C.

He exhibited fibers and film prepared from the crystalline polypropylene, which have higher strength and stiffness than similar products from non-crystalline olefins.

The International Union of Pure and Applied Chemistry will hold its next meeting in Paris in July 1957.

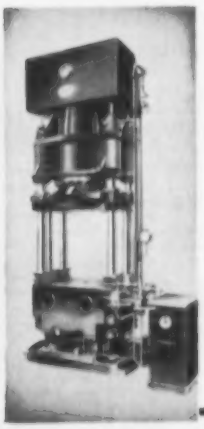
IUPAC Plastics Division

The Division of Plastics and High Polymers held three sessions in Zurich during the IUPAC Conference, under the chairmanship of H. V. Potter, managing director of Bakelite Ltd., England. Subjects considered included identification tests, industrial classification systems, preferred names for families and types of plastics and high polymers, and abbreviated designations. Draft proposals relating to these topics are being prepared for circulation and industry review, prior to preparation and publication of international IUPAC recommendations.

The following nominations for officers and members were submitted to IUPAC:

Chairman—R. Houwink (Netherlands); Vice-Chairman—F. Patat (Germany); Secretary—G. M. Kline (U.S.A.); Members—B. S. Berndts-

(To page 251)



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son (Sweden); G. Dring (Great Britain); P. Dubois (France); K. Frey (Switzerland), and A. Nasini (Italy).

The Division plans to hold its next meeting in the Netherlands in September 1956.

Macromolecular Commission

The IUPAC Macromolecular Commission, under the chairmanship of Prof. H. Mark of Brooklyn Polytechnic Institute, held three committee sessions in Zurich to discuss proposals pertaining to nomenclature and methods for the determination of molecular weights of high polymers. A Symposium on Macromolecular Chemistry was held in Zurich on July 28 and 29 with Dr. H. Staudinger (Germany) as honorary chairman. The ten papers presented dealt with the chemistry and technology of synthetic and natural high polymeric substances.

The next symposium of the IUPAC Macromolecular Commission will be held jointly with the Weizmann Institute of Science, Rehovot, Israel, April 3 to 10, 1956. Some of the sessions will also be held in the Hebrew University of Jerusalem and the Israel Institute of Technology in Haifa. The topics of the symposium will be 1) general behavior of polymers in solution, 2) general behavior of biocolloids and polyelectrolytes in aqueous solution, and 3) special polymeric systems in solution. A 1000-word abstract of papers proposed for submission should be sent to the chairman, Prof. E. Katchalski of the Weizmann Institute, by December 1, 1955; two copies of full manuscripts are due by February 1, 1956. The papers and discussions will be published in a special issue of the *Journal of Polymer Science*.

The Technical Panel on Wood Chemistry of the Food and Agriculture Organization of the United Nations will meet in Israel in conjunction with the International Symposium on Macromolecular Chemistry. Their program will include lectures on the following topics: 1) the morphology of wood fiber and chemistry of the middle lamella; 2) the bonding mechanism of lignocellulose materials; 3) new chemicals for wood plasticization; 4) the theory of adhesives; 5) new resins for laminating wood; and 6) new types of adhesives for gluing wood fragments.—END

Making Inflatables

(*From page 127*)

worked on a method for making inflatable items in a more economical manner. The goal was a method which would work continuously and which would allow the producer to employ machines normally used for processing sheet. A method† has been developed whereby it is possible to use all continuous welding machines such as the Auma machine (Berstorff, Hanover, Germany); the Rotocure machine (Boston Woven Hose & Rubber Co.); and the Dornbusch machine (Krefeld, Germany).

The principle of the new method consists in placing a non-adhesive layer of a suitable plastic between the sheets in the places where no bond is desired and then passing the layers of sheeting through a continuous welding machine. The placing of the non-adhesive layer is very simple. A solution of polyamid is applied by the silk-screen printing process to the sheet of PVC in the places where air cells are required. When the solution is dry, the printed sheeting can be rewound or passed directly to the welding machine. Sharp bending must be avoided until the welding has been completed.

In order to assure absolute airtightness, it is an advantage to use two or more thin sheets instead of one thicker sheet. Through the heat and pressure of the machine all the sheets will weld together (become laminated) with the exception of the places where the non-adhesive layer prevents the welding. When the sheeting has left the welding machine, the contours of the non-adhesive layer can be seen on the surface, and each item can be cut out, or the bonded material in sheet form can be rewound and delivered to a fabricator. The non-adhesive layer insures easy inflating and has no influence on the stability and flexibility of the finished product. The inlet valves can be fastened by gluing or high-frequency welding.

The incorporation of suitably coated textiles increases considerably the strength of the finished product. By the described process it is simple to produce air chambers in layers above each other, essential in complicated items.—END

†Patent applied for

Soil Stabilization

(*From pp.* 152-158)

Society of Chemical Engineers in New York, N. Y., Oct. 1954.

c. "Equipment for Soil Stabilization With Calcium Acrylate," by S. M. Rosenberg, M.I.T., Department of Civil Engineering, B. Sc. Thesis, 1950.

d. "An Economic and Engineering Forecast of the Commercial Application of Calcium Acrylate for the Stabilization of Soils," by R. S. Gooch and F. G. Lehmann, Massachusetts Institute of Technology, Dept. of Civil Engineering, B. Sc. Thesis, 1951.

e. "Impermeabilization of Cohesionless Soils by *in situ* Polymerization," by J. A. Jansen and C. R. Supplee, Massachusetts Institute of Technology, Dept. of Civil Engineering, M. Sc. Thesis, 1952.

f. "Investigation of Base-Exchange and Polymerization for the Stabilization of Soils," by Victor F. B. de Mello, M.I.T., Department of Civil Engineering, D. Sc. Thesis, 1949.

g. "The Stabilization and Impermeabilization of Soils by the Injection of Calcium Acrylate," by Philip F. Zaccheo, Massachusetts Institute of Technology, Dept. of Civil Engineering, M. Sc. Thesis, 1951.

h. "Equipment for Mixing and Placing Calcium Acrylate-Treated Soil," by R. G. Williams, Massachusetts Institute of Technology, Dept. of Civil Engineering, M. Sc. Thesis, 1952.

i. "Engineering Properties of Calcium Acrylate-Treated Soils," by Carl A. Watkins, Jr., Massachusetts Institute of Technology, Dept. of Civil Engineering, M. Sc. Thesis, 1951.

j. "Factors Affecting the Induction Period in the Polymerization of Calcium Acrylate," by Gordon J. Williamson, M.I.T., Department of Chemical Engineering, M. Sc. Thesis, 1950.

19. Ref. 18a, p. 142.

20. Ref. 18e, p. 6 et seq.

21. U. S. Patent No. 2,401,348, June 1946, to A. E. Hansen, and ref. 3c, p. 127.

22. Ref. 18i, p. 24.

23. Ref. 18g, p. 88.

24. Ref. 18d, p. 6.

25. Ref. 18d.

26. Ref. 18c, p. xi.—END.

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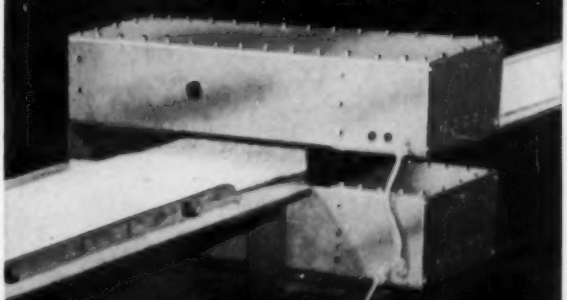

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, AND CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946, of MODERN PLASTICS, published monthly at Bristol, Connecticut, for October 1, 1955.

State of New York
ss.
County of New York

Before me, Notary Public in and for the State and County aforesaid, personally appeared Charles A. Breskin, who, having been duly sworn according to law, deposes and says that he is the Publisher of MODERN PLASTICS and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), to wit:

1. The names and addresses of the publisher, editor, managing editor, and business manager are:

Publisher, Charles A. Breskin, 575 Madison Ave., New York City.

Editor, Hiram McCann, 575 Madison Ave., New York City.

Managing editor, A. Paul Peck, 575 Madison Ave., New York City.

Business manager, A. S. Cole, 575 Madison Ave., New York City.

2. The owner is: (if owned by a corporation, its name and address must be stated and also, immediately thereunder the names and addresses of stockholders owning or holding one percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as those of each individual member, must be given.)

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Charles A. Breskin, 575 Madison Ave., New York, N. Y.

Mrs. Charles A. Breskin, 59 Park Road, Scarsdale, N. Y.

Mrs. Linda B. Klein, 1 South St., New Haven, Conn.

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CHARLES A. BRESKIN, Publisher

Sworn to and subscribed before me this 14th day of September 1955.

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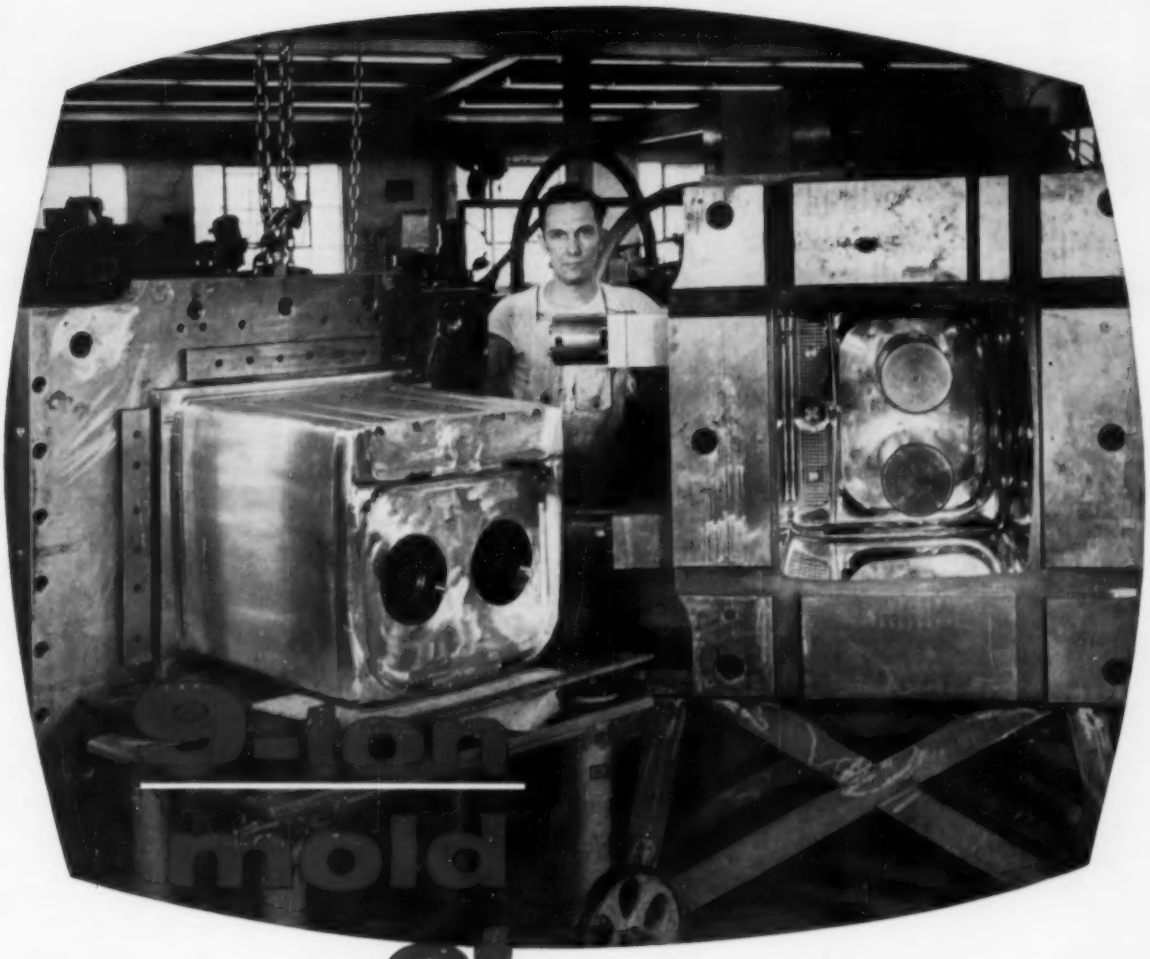

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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Coal Company Enters Phenolic Resin Industry

SUBSTANTIAL new quantities of phenolic molding material, cresylic acids, cresols, phenol, and similar materials will be available soon from Pitt-Consol Chemical Co., a newly formed subsidiary of Pittsburgh Consolidation Coal Co. The coal firm has recently purchased the Newark, N. J., plant of Reilly Tar & Chemical Corp. and will spend from $3 to $3½ million in complete renovation of the former Reilly property at 191 Doremus Ave. and in the construction of new production facilities which will be operated by Pitt-Consol.

While initially the feed material for the Newark plant will be the waste streams of petroleum refineries, the liquids produced by the company's low-temperature coal carbonization process can be used for future expanded production.

Pittsburgh Consolidation has completed development of a continuous fluidized process for carbonizing coal and expects to apply the know-how obtained over years of experimentation in that field to its new enterprise. Low-temperature coal carbonization gives a yield of 12 to 13 times as much tar acid as high-temperature distillation, such as the coke oven method. According to some chemists, it has just as many possibilities as the coal hydrogenation method which requires a plentiful supply of hydrogen. However, the carbonization method limits the products obtained to cresols, xylenols, and cresylic acids. Higher temperatures must be employed, as in the coke-oven by-product and hydrogenation methods, to obtain aromatics such as toluol or benzol.

The Pitt-Consol operation is a first step toward utilizing its experience in coal carbonization and the refining of liquids thus obtained for production of high quality cresylics and related materials. It is a logical branching out for a fuel company such as Pittsburgh Consolidation Coal Co. since it will give them an operation whereby they can sell about 70% of their production as "char" or fuel and 30% as chemicals.

Reilly Tar & Chemical Corp., which is primarily a coal tar chemical producer, will henceforth concentrate its operations in the Midwest where the company has 15 plants. The Newark plant was built originally to process tars derived from eastern coke plants used in gas making. Its operations have been curtailed over the years as the supply of coal tar became less available in the East due to the influx of pipelined natural gas.

The principal products sold from the Reilly plant in Newark were a limited amount of phenolic molding powder to special customers and various acids or intermediates sold to customers, such as laminators, who converted them into resins—particularly liquid resins.

Pitt-Consol expects to expand this business and is planning a promotional campaign toward that end. Increased production of phenolic molding powder is to be particularly stressed, but other phenolic resins such as those used in laminating, shell molding, abrasive bonding, and brake linings may be offered to the trade some time in the future.

The company is particularly concerned with its ability to produce an improved grade of cresylic acid. Cresylic is often preferred to phenol for some grades of phenolic type resins, especially laminating, bonding, and friction-type formulations; some users also prefer the resulting electrical properties. Unfortunately, an uncertain supply situation has frequently forced use of other acids when cresylic was wanted. Pitt-Consol expects to be soon in a position where it can assure the industry that a good supply of cresylic will always be available.

Joseph Pursglove, Jr., vice president of research and development of Pittsburgh Consolidation Coal, will be president of the new Pitt-Consol Chemical Co. R. H. Martin is general manager; B. W. Jones, sales manager; and R. L. Comstock, superintendent.

Nopco Foam

MARKETS for urethane foam will expand from about 400,000 lb. this year to a 100 million-lb. annual market in the next five years, says Ralph Wechsler, president of Nopco Chemical Co., Harrison, N. J. Vinyl foams have a potential volume of 170 million lb. by 1960, according to Mr. Wechsler.

These estimates were made public simultaneously with the announcement that his company will open two new plants this year and a third next year for production of foam. For earlier details of Nopco's plans, see p. 260, Sept. 1955, MODERN PLASTICS.

George G. Stier, who has been with Nopco since 1932 and assistant vice president in charge of the Industrial Marketing Div. since 1953, will head up the newly established plastics division of Nopco.

Diversification

INDUSTRIAL giants in search of diversification have been moving into the plastics industry at a rapid rate. One of the first to start on this course was The General Tire & Rubber Co., Akron, Ohio. The company's latest move is the proposed purchase of Respro, Inc., Cranston, R. I., and its subsidiaries. Stockholders of General Tire will vote soon on the transaction. More than 75% of Respro's stockholders have already approved this proposed transaction according to press reports.

Respro is a major producer of vinyl film, sheeting, and coated materials. Its subsidiaries, United Lace & Braid Co., Lion Products Co., and United Chemicals, Inc., manufacture shoe materials, tapes for electrical and other installations, shoe laces, insulation, dress and millinery braid, rubberized fabrics, and other products. The company employs 350 persons. If the sale is consummated, Respro will be operated as a division of General Tire.

General Tire's first major move into the plastics industry came several years ago when they established

* Reg. U.S. Pat. Off.

a calendering and extrusion plant in Jeannette, Pa., for processing vinyl chloride materials. The firm's various divisions now engaged in vinyl calendering, extrusion, and coating processes include Textileather Corp., Toledo, Ohio, and Bolta Products Co., Lawrence, Mass., in addition to the Jeannette plant and the proposed Respro purchase.

Other plastics operations include a vinyl chloride resin plant, a urethane foam operation, and the Aerojet plant in California, which is working primarily with reinforced plastics for aviation and missile purposes.

In addition, the company is a leading rubber and rubber products producer, owner of the Mutual Broadcasting System, recent purchaser of RKO-Radio Pictures, Inc., and producer of athletic goods, liquid fuels, and rocket motors.

Teflon Rod and Tubing

HEAVY- or thin-walled tubing as well as rod made from Teflon is now available from Pennsylvania Fluoro Plastics Co., 1115 N. 38th St., Philadelphia 4, Pa.

Heavy-walled Teflon tubing will withstand service temperature from —445 to 550° F. It can be used for pipe and also for stock from which pump and valve parts are machined. Practically any shape of electrical insulator can be machined from this tubing. It can also be used for fluid handling systems in which the liquid contacts only Teflon. Sizes vary from 0.058- to 1.476-in. I.D. and 0.250- to 2.000-in. O.D. Prices range from 96¢ to $16.77 per ft. in lots under 10 ft. to 68¢ to $14.26 per ft. in lots over 500 feet.

Thin-walled tubing is being used for fuel lines in jets and rockets; for sheathing electrical wires; and for transporting liquid chemicals. It will not contaminate a pharmaceutical or food stream. Sizes vary from 0.185- to 1.100-in. O.D. and 0.125- to 1.000-in. I.D., with wall thicknesses from 0.030 to 0.050 inch.

Spaghetti sleeving or slip-on insulation is used in electronics applications primarily for connecting components. Continuous service temperature is 250° C., or more than 100° C. above other materials used for the same purpose. Several companies are using Teflon spaghetti tubing for applications where the service temperature is only around 100° C. Savings are made because the material simplifies soldering techniques; it is not harmed by the hot soldering iron. Other uses are for instrument tubing, sheathing for several wires, medical tubing, and replacement for hook-up wire insulated with Teflon.

Extruded rods with service temperatures up to 520° F. are suggested for machined electrical parts, valve and pump parts, and ball bearings. It is furnished in diameters from 0.188 to 2 inches. Prices range from 55¢ to $28.75 per ft. in lots of 500 ft. or more.

The material can be tailored to color, special sizes, and incorporation of fillers for improved mechanical properties.

Berton E. Ely, formerly of Du Pont, is in charge of production and John W. Burley, formerly of Jennings Engineering Co., Philadelphia, Pa., is in charge of sales.

Mysterious Upholstery

SOMETHING new in porous vinyl-coated upholstery has been introduced by B. F. Goodrich Co., Industrial Products Div.

The material, known as Air-Porous Koroseal, is still in the "mysterious" classification because only superficial details are available. It is stated to be composed of microscopic, inter-connecting cells that literally "air-condition" the plastic material. It has more than 50,000 inter-connecting cells to the square inch, feels cool and fresh in summer heat, yet remains comfortable and pliable at winter temperatures, according to Clyde O. DeLong, president of B.F.G.'s Industrial Products Div., who asserts that the porous, air-filled cellular structure of the new material permits evaporation of perspiration—an important property for upholstery.

The almost miraculous claims made for the new material arouse intense curiosity. The material is not perforated and thus does not depend for its porosity on holes that might close up. It is neither foam nor sponge. It is claimed to be the first and only ventilated plastic upholstery that is water repellent. The vinyl chloride material can be applied to any type of backing material including knit backs, sateen, broken twill, drills, and sheetings. There are no limitations on the types of embossing or printing that can be applied.

The new material will be introduced for automotive, office, and home upholstery use with a leather-like grain in 20 colors. Other patterns will follow. Reasonable amounts are now available with large quantities expected in early 1956. Cost is now slightly more than the best vinyl-coated fabrics but will be lower when the market for large quantities is developed. Present uses are mostly for upholstery where fabrics and leather are now employed, but prices are lower than these materials, and there is the added advantages of comparable comfort, cleanability, and cutting economies.

New Engineering and Sales Groups

ESTABLISHMENT of two new sales groups, each of which will work with a specific branch of industry, has been announced by Monsanto Chemical Co.'s Plastics Div., Springfield, Mass. One group will handle automotive sales; the other will specialize in structural plastics, and is believed to be the first such unit in plastics.

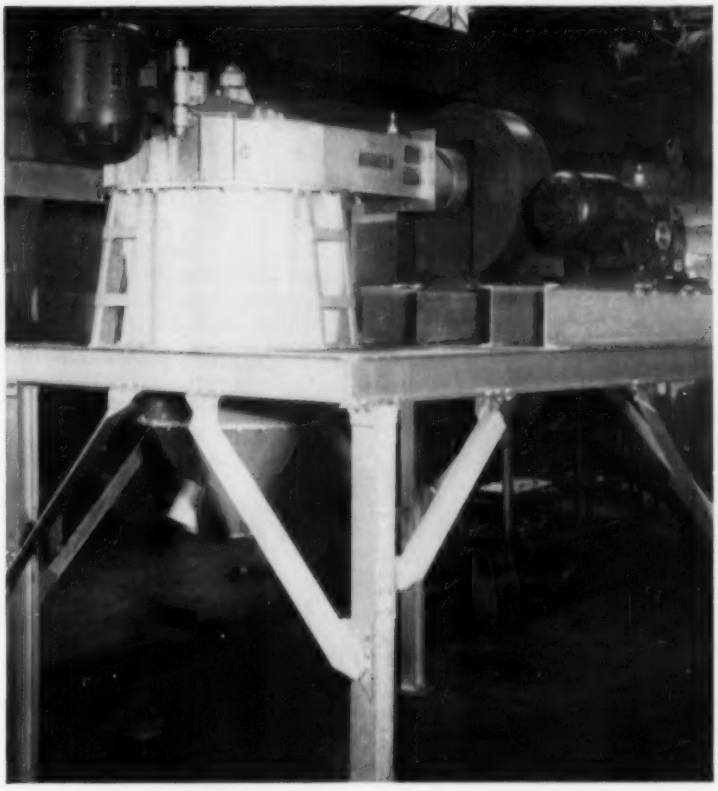
The structural plastics engineering group will be responsible primarily for the coordination of Monsanto's broad program aimed at developing reliable performance information for the use of architects and builders in specifying plastics.

In addition to coordinating structural plastics studies within Monsanto, the new group's functions will include developing, correlating, and publishing structural plastics engineering data, as well as participating in technical and trade society activities and joint testing programs. Construction and evaluation of plastics structural component prototypes also will be included in the new group's functions.

At the same time, the company announced the appointment of

NEW TYPE STURTEVANT AIR SEPARATOR

Recovers Fines in Micron Ranges



Now the famous Sturtevant Whirlwind Air Separator, so widely used throughout industry for fast recovery of fines, has been specially designed to "pick-off" classified materials such as pigments, limestone fillers, plastics, oyster shells, etc., in micron sizes.

These highly efficient air separators select a continuously uniform product of desired fineness. Used in a closed circuit with grinding mills, they increase production, cut power costs.

Large feed opening, rugged construction, ease of adjustment, low power consumption assure economy of operation and minimum upkeep. Write for further information.

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Designers and Manufacturers of:
CRUSHERS • GRINDERS • SEPARATORS
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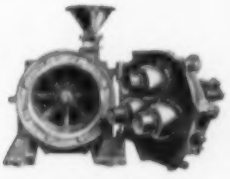
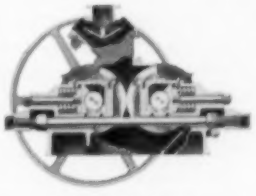
OTHER STURTEVANT EQUIPMENT

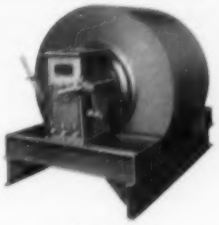
MICRONIZER® GRINDING MACHINE
A fluid jet grinding machine, the Sturtevant Micronizer speeds reduction of materials to low micron sizes. These jet mills are especially applicable in fields where a particle size in microns is desired.
Sturtevant Micronizer grinding machines are available in many sizes and capacities.



RING-ROLL MILLS
For medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operate in closed circuit with Screen or Air Separator. Open door accessibility. Many sizes. No scrapers, plows, pushers, or shields.



CRUSHING ROLLS
For granulation, coarse or fine, hard or soft materials. Automatic adjustments. Crushing shocks balanced. For dry or wet reduction. Sizes 8 x 5 to 38 x 20. The standard for abrasives.



BLENDER
Four-way mixing action assures a thoroughly blended product. Open-door accessibility permits easy cleaning. Available in many mixing capacities for ¼-ton per hour and up.

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Michael F. X. Gigliotti as manager of the structural plastics engineering group. Mr. Gigliotti was in charge of the construction of the division's polyethylene plant in Texas City, Texas. Joshua S. Miller has been named to the newly created post of manager of automotive sales. He was assistant product sales manager of Resinox thermosetting molding materials since 1953.

Pipe Producer

ANOTHER combination of companies to produce and sell rigid polyvinyl chloride pipe was announced by Fred W. Belz, president of Walworth Co., 60 E. 42nd St., New York, N. Y., in a recent talk before the New York Society of Security Analysts, Inc.

Mr. Belz stated that Walworth has entered into an exclusive manufacturing arrangement with General American Transportation Co. whereby General American will produce in its East Chicago plant rigid P.V.C. pipe, fittings, and valves exclusively for Walworth to Walworth specifications and standards. Walworth will sell and distribute these products.

Production of pipe and fittings was scheduled for September and valve production is expected to be under way after the first of the year. Mr. Belz said that he did not expect this Walworth product development to reflect substantial returns in 1955, but that the company expected to put on an aggressive push in this field in 1956.

New Inorganic Filler

PILOT-PLANT production of a new inorganic filler material known as Kanamite, which is slated for commercial production shortly, has been announced by Ferro Corp., 4150 E. 56th St., Cleveland 5, Ohio. Currently the initial production is being used in casting resins for certain classified electronic equipment, as a core filler in plastic dies, and as a strength additive in foamed plastics.

Kanamite is the trademark for unicellular, spheridized clay particles fired at around 3000° F. in a process which was developed several years ago by Kanium Corp. in a research project conducted at the Armour Research Foundation. The particles are small, hollow glass spheres.

Bulk density of Kanamite runs 29 lb./cu. foot. According to Ferro, lighter densities to 15 lb./cu. ft. will be feasible in the new commercial production, provided that such products are in demand.

In addition to being an inorganic displacement filler in plastics, the company claims that Kanamite also adds considerably to the flowability, and in proper usage, percentage-wise, can contribute additional strength. Shrinkage in curing can also be reduced.

Guaranteed Wall Tile

IN A MOVE to provide a basis for upgrading the plastic wall tile industry and to provide a means for selling quality products, The Dow Chemical Co., Midland, Mich., has instituted a guarantee program for wall tile made from Styron.

The program, designed to assure consumer satisfaction with product, mastic, and installation, includes an emblem and a guarantee form for certified dealers.

Dow has presented the program to all wall tile manufacturers in the industry. Many of them are already developing their merchandising and advertising around it and in turn are taking the program to their wholesalers and retailers. Manufacturers representing over three-fourths of the plastic wall tile business have indicated a desire to further the program through their own efforts.

Donald L. Gibb, sales manager of Dow's Plastics Dept., states that while the plastic wall tile industry has had a standard since 1950, it has been difficult for consumers to distinguish a non-standard product by appearance. The industry has requested a directive from the Federal Housing Administration requiring that polystyrene tile must conform to the standards issued by the U. S. Department of Commerce before it is eligible for FHA financing. The Dow program is designed to provide qualified dealers with a guarantee that the product does conform to the standards.

Eligibility rules include: 1) Tile must conform to NBS 168-50; 2) manufacturer must have adequate complaint handling procedure; 3) manufacturer must guarantee his product against defects in materials and workmanship, including color matches; 4) tile must be made of "mill-colored" materials—not dry blended; and 5) major portion of the tile product must be made of Styron.

Dow supplies wall tile manufacturers with both the dealer emblems and guarantee forms at cost.

Large-Diameter Kel-F Rod

MOLDED Kelon-F (Kel-F, fluorothene) rod in sizes from 5/8-in. to 5-in. O.D. and tubing in wall thicknesses from 3/8 in. are available for the first time in production quantities from Shamban Engineering Co., 11617 W. Jefferson Blvd., Culver City, Calif.

The company states that Kelon-F products are suitable for service applications involving corrosive chemicals, solvents, and heat from —300 to 400° F. in continuous service. Chemically inert, non-adhesive, and with a low coefficient of friction, the material is offered for applications in chemical laboratories and electronics. Uses include laboratory ware, gaskets, equipment for handling corrosive fluids, aerial supports and spacers, coaxial spacers, coil forms, infra-red optics, low-temperature seals, O-rings, probes, transformer terminals, and valve seats.

Plastics for Packaging

FORMATION of Trand Plastics Co., 40 Belden Ave., Norwalk, Conn., has been announced by Nils Anderson, Jr., chairman of the board, and John Troth, president. The new firm will specialize in vacuum formed packaging and opaque and transparent plastics folding cartons, and will also produce several proprietary and industrial items made of thermoplastic sheet. The company will extrude its own sheet and vacuum form products with equipment especially designed to integrate the two operations.

Mr. Anderson is president of Debevoise-Anderson, Inc., New York, N. Y., and was head of the Plastics Div., WPB, during World

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War II. Mr. Troth has had many years of experience in packaging, with special emphasis on plastics packaging. He was formerly president of Troth-Bright-Page, Inc., Paoli, Pa., the first company to manufacture plastics folding cartons, and later organized and became manager of Robert Gair Co.'s Plastafol Div., New York, N. Y.

Phenolic Foam

TRADENAMED Marblette #1200, new phenolic foam resin, claimed to possess superior properties and which will set at room temperature within an hour, has been developed by The Marblette Corp., 37-21 30th St., Long Island City 1, N. Y.

Vinyl Foam Fabricator

PRODUCED by Great American Industries, Bedford, Va., vinyl foam is being fabricated into consumer products and offered to the trade by Presto Mfg. Co., Inc., 2 Franklin Ave., Brooklyn 11, N. Y.

One of Presto's items is vinyl foam electronically fused to vinyl film or sheet. It is necessary to seal only along the edges, thus enhancing the "cushiony" effect of the finished item. In this form, the material is suggested for uses wherever a strap is used—skates, belts, handbags, and shoulder straps for camera kits. It is also used as a pad on store counters for displaying jewelry, gloves, etc. because it doesn't slip on the counter and can be washed when soiled. When fused to clear vinyl, the material gives a sparkle that makes it attractive for hair accessories, novelties, or wherever a decorative effect is desired.

When used without a vinyl coating or skin, the foam is fabricated by Presto for such items as a shock absorber for gun cases or in boxes where glass or other fragile contents are subject to damage. Bust pads are another possibility.

Presto officials state that the material can be embossed, die cut, split, or skinned; it has 100% dimensional stability; will breathe when used without a backing; and has the usual chemical and flame resistance, as well as other properties common to vinyl. The material is also a good sound absorber. One of its great advantages, according to Presto, is that it is more readily heat-sealable than other foams. It is not recommended for shoe soles or automotive upholstery since it has a fusion point of about 160° F.

The material is less costly than latex foam or sponge rubber of similar density and approximately the same price as urethane foam, of which Presto is also a fabricator.

Plastic-Iron for Microwaves

INTRODUCTION of a new material, called Narda-Iron, which consists of powdered iron dispersed in an epoxy resin and cast to shape, has been announced by The Narda Corp., Mineola, N. Y. An added feature of the material is that the castings can be drilled or otherwise machined with ordinary metalworking tools.

The iron-plastic combination is presently being used in microwave test equipment, where its electrical characteristics make it ideal for coaxial terminations. For example, a very low VSWR (vertical standing wave ratio) is desirable in certain microwave work and, with Narda-Iron, the value is stated to be less than 1.05 over the entire frequency range from 2400 to 12,400 megacycles.

Short Course in Plastics

TWO additional plastics conferences for the coming school year have been instituted by The University of Wisconsin, University Extension Division. The first conference will be on plastic processing and will be held on October 27 and 28. The subjects which will be reviewed include transfer, compression, and injection molding; designing; and testing.

Molding P.V.C.

A PROCESS for the injection molding of rigid unplasticized polyvinyl chloride has been developed by Wilmington Plastics Co., 810 S. Heald St., Wilmington, Del. The process permits the injection molding on a production basis of items from unplasticized P.V.C. which are comparable with those produced from other thermoplastics. It is based on a special injection heating cylinder which may be used with any standard injection machine.

Another Vinyl Plant

PLANS to build a new plant in Passaic, N. J., for the production of polyvinyl chloride have been announced by Eleanora Chemical Corp., a newly formed subsidiary of The Pantasote Co., 26 Jefferson St., Passaic. The plant, scheduled for completion in 1956, will be designed and constructed by Scientific Design Co., Inc.

While the capacity of the new plant has not been made public, the company reports that its entire output will be consumed by Pantasote, a producer of coated fabrics and vinyl film and sheeting.

This is the third P.V.C. plant currently being engineered by Scientific Design. The firm recently concluded a contract with Thompson Chemical Co., Pawtucket, R. I., and construction on that plant will begin soon. The name of the principal in the third project has not been announced.

Courses in Plastics

FOR the first time beginning this fall, the Newark College of Engineering Special Courses Division, in cooperation with the Society of Plastics Engineers, will present a three-year evening program in plastics technology.

The program will feature basic and advanced courses in modern methods and techniques used in the production of plastics. The curriculum will also include courses in fundamental principles of engineering to give the student the background essential for the study of plastics technology.

Plastic Solder for Cans

A TINLESS, organic soldering material that promises to relieve the container industry of its dependence on imported supplies of tin has been announced by Dewey & Almy Chemical Co., Div. of W. R. Grace & Co., Cambridge 40, Mass. According to D. L. Shanklin, general manager of container and chemical specialties, the new bonding agent is a thermoplastic organic material having excellent adhesion to plain metal as well as to most of the interior lacquer coatings used in cans today;

CYCLE TIME ON PLASTIC CONTAINER SHORTENED **11%** BY

HI-FLOW 55
MONSANTO LUSTREX
Styrene Plastic

How Monsanto's soft-flowing styrene is speeding production and cutting rejects

The container walls are 62/1000 of an inch thick . . . the design is intricate . . . the styling must complement the hair dressing accessories packed inside. High-speed production of such an item requires expert engineering and the right molding material. And the right material for the job is Monsanto's Lustrex Hi-Flow 55 Styrene according to Don White, Plastics Superintendent of the Tip Top Products Company, Omaha, Nebraska. Since switching to Monsanto's soft-flowing compound, production has increased impressively. Cycle time has been cut from 36 seconds to 32 seconds. On a 24-hour schedule output is boosted as much as 18%. Lustrex Hi-Flow has also made possible a pressure drop ranging from 300 to 800 pounds per square inch, and a heat reduction of 15° F. There is no more trouble with the shots sticking in the deep cavities of the mold—no blurring of the container's detail. Perhaps Monsanto's soft-flowing styrene can speed up cycles and increase production rates on some of your jobs. See your Monsanto representative about Lustrex Hi-Flow 55 or write Monsanto Chemical Company, Plastics Division, Dept. MP-10, Springfield 2, Mass.

MONSANTO

Save on your next job . . . try Monsanto Lustrex Hi-Flow 55 Styrene Plastic

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it also has high strength, testing an average of 15 lb. stronger than tin-lead solders.

The material is applied to can seams at a temperature of 345° F. Cooling to 275° F. solidifies the compound which increases the strength of the seam and makes an airtight seal. Normal food processing temperatures (240° F. for 30 min.) do not affect the bond.

The new high-strength solder is an outgrowth of similar low-strength cements announced by Dewey & Almy several years ago. These are now being used successfully in billions of motor oil cans, Mr. Shanklin stated. Food processors have also started to use them to seal frozen concentrate packs and cans for tomato paste.

Water-Dispersed Colors

WATER dispersions of organic and inorganic pigments and selected oxide pigments have been added to the regular dry-color operation of Kentucky Color & Chemical Co., 600 N. 34th St., Louisville 12, Ky.

Technical sales and research in the new department is headed by John G. Smith and plant production by Paul Tudder. Mr. Smith was formerly with United Wallpaper Co. as development chemist in pigment dispersions.

Printing on Urethane

SILK-SCREEN printing on flexible urethane foam has been developed to a high degree by Süddeutsche Schaumstoff-Druckerei, Eningen-Reutlingen, Germany. The company is offering to license its process to any interested firms in the United States.

Nylon Synthetic Paper

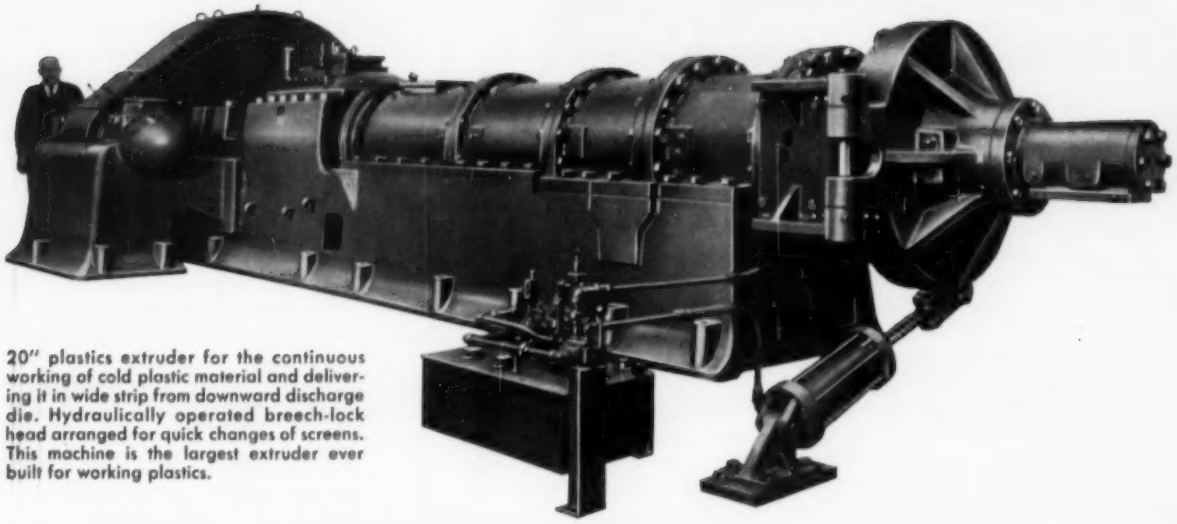
FIRST commercial run of synthetic paper made wholly from nylon fiber has been produced by Riegel Paper Corp., 260 Madison Ave., New York 16, N. Y. It is almost impossible to tear the synthetic nylon paper by hand and the material is claimed to be many times stronger than paper made with rags or wood pulp. In addition, it is highly resistant to chemical attack, absorbs very little moisture, and resists the action of molds, bacteria, and light.

Nylon paper is suggested for use in such applications as heavy-duty bags, for filtration of corrosive liquids and packaging chemicals, in map and tracing papers, and for important records and documents where permanence is necessary.

Honeycomb for the East

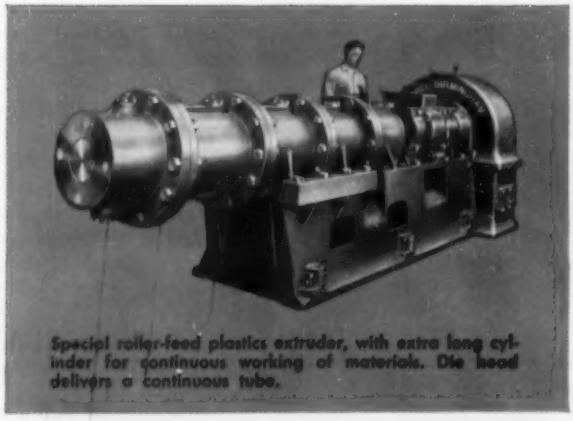
LATEST expansion of Hexcel Products, Inc. (formerly California Reinforced Plastics Co.), Oakland 8, Calif., encompasses the establishment of an Eastern Div. in Baltimore, Md. The division will provide an expanded sales force and a processing operation which is scheduled to start production before the end of the year. Richard J. Guerin will head up the new Baltimore facility as plant manager.

All future correspondence regarding structural honeycomb core mate-

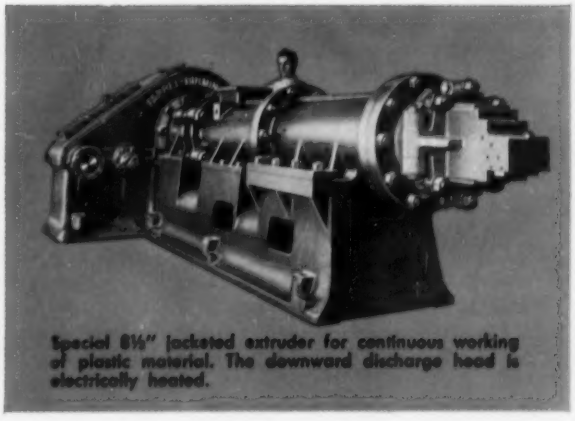


20" plastics extruder for the continuous working of cold plastic material and delivering it in wide strip from downward discharge die. Hydraulically operated breech-lock head arranged for quick changes of screens. This machine is the largest extruder ever built for working plastics.

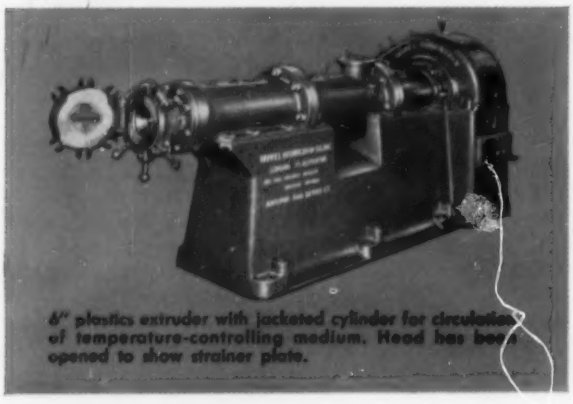
FARREL-BIRMINGHAM PLASTICS EXTRUDERS
built to your requirements



Special roller-feed plastics extruder, with extra long cylinder for continuous working of materials. Die head delivers a continuous tube.



Special 8½" jacketed extruder for continuous working of plastic material. The downward discharge head is electrically heated.



6" plastics extruder with jacketed cylinder for circulation of temperature-controlling medium. Head has been opened to show strainer plate.

Farrel-Birmingham has developed a complete line of heavy-duty, screw-type extruding machines for processing plastics.

They are designed to blend and fuse the ingredients of various plastics into a homogeneous whole, to process plastic reclaim and to transfer and form materials discharged from the Banbury mixer.

The various features of the machines are dictated by the use intended for the machine and the particular requirements of the application. Screw diameters range up to 24". Write for information about extruders for specific applications.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Akron, Pittsburgh, Chicago, Fayetteville (N. C.), Los Angeles, Houston

FB-1000

F-B PRODUCTION UNITS—Banbury Mixers, roll mills, calenders, extruders, plasticators, hydraulic presses and other equipment.

Farrel-Birmingham ®

rial for the East should be addressed to 238 N. Franklintown Rd., Baltimore 23, Md. Some shipments will continue to be made from Oakland. Eventually, however, the company plans to have the Eastern Div. handle all material requirements for this area, which will result in shorter in-transit time and a decrease in shipping charges.

Cold Solder

TRADENAMED Arcco C 540, a new cold solder which performs the functions of a conventional hot solder but requires no heat, has been developed by American Resinous Chemicals Corp., Peabody, Mass. A combination of resin and metallic powder, the product bonds strongly to most metals and dries to a metallic film. No heat is necessary to produce a film which can be buffed or filed and which is highly resistant to elevated temperatures.

Arcco C 540 is available to adhesive manufacturers for distribution in metal tubes or small packages for general use in household applications.

Knit Fibrous Glass

FULL production of Duofold Fabric H-3, knit elastic fibrous glass-reinforcing fabric for use in plastics processing, is now under way in the plant of Duofold, Inc., Mohawk, N. Y.

Duofold Fabric H-3 is made of tubular knit fibrous glass in sleeve form and is available to fit almost any application. The fabric is claimed to be ideal for use in curved or cylindrical surface laminations, such as in aircraft parts. The elasticity of the knit stitch allows full flexibility of stretch.

PLASTICIZER NEWS

Advance Solvents Prices—New price of its plasticizer Plastoflex MGB is now 29¢ per lb. in tank car lots and 31¢ per lb. in carload or truckload shipments, according to an announcement by Advance Solvents & Chemical Corp., 245 Fifth Ave., New York 16, N. Y.

Plastoflex MGB is a modified polypropylene glycol dibenzoate and is a primary plasticizer for vinyl chloride resins and other plastics materials. Advance Solvents claims that tensile strength obtained with Plastoflex MGB is considerably higher and modulus of elasticity is better when Plastoflex MGB is used instead of D.O.P.

The company also announces the availability of Advastab 50-671 (replacing 50-OS) as a new polymeric thio organo-tin stabilizer. It is claimed to have very low odor, which is unusual for sulfur-containing compounds. Advastab 50-671 is similar to Advastab 17M. Price of Advastab 50-671 is $2.55 per lb. in 5-drum lots and $2.85 in less than drum lots. Advastab 17M sells for $2.95 in 5-drum lots and $3.25 in less than drum lots.

Non-Toxic Plasticizer—Use of Paraplex G-60 plasticizer for plastic films used by federally inspected meat plants to package bacon, lard, oleomargarine, and similar products has been approved by the Food and Drug Administration and Meat Inspection Branch of the Department of Agriculture. Up to 25% of the plastic film may be Paraplex G-60.

The testing program which established the suitability of Paraplex G-60 for such uses included determination of the toxicity of the plasticizer when fed to dogs for one year and rats for two years. Studies showed that, even when Paraplex G-60 made up as much as 5% of the animals' diets, 1) mortality was not significantly affected; 2) growth patterns were satisfactory; 3) blood chemistry was not significantly altered; and 4) no lesions were found upon histopathological analysis.

Studies were also conducted under accelerated conditions to determine the extractability of Paraplex G-60 from polyvinyl chloride in contact with animal and vegetable oils and aqueous media under various conditions of acidity, as well as the plasticizer's effect upon skin and eyes. Results were all favorable.

High and Low Temperatures—Manufacture of Pittsburgh PX-220 (di-iso decyl adipate), a plasticizer especially suitable for vinyl formulations requiring high-temperature processing cycles or low-temperature flexibility has been announced by Pittsburgh Coke & Chemical Co.'s Plasticizer Div., 2023 Grant Bldg., Pittsburgh, Pa.

The company states that the properties of PX-220 make it especially suitable for use in combination with other plasticizers in products such as upholstery stocks, garden hose, tubing, gasketing, and electrical insulation.

EXPANSION

Union Carbide and Carbon Corp. announces that the corporation has arrived at an agreement to buy an option held by the New York Central Railroad, which will enable Union Carbide to purchase the long-term leasehold on the entire block between Park and Madison Aves. and 47th and 48th Sts., New York City.

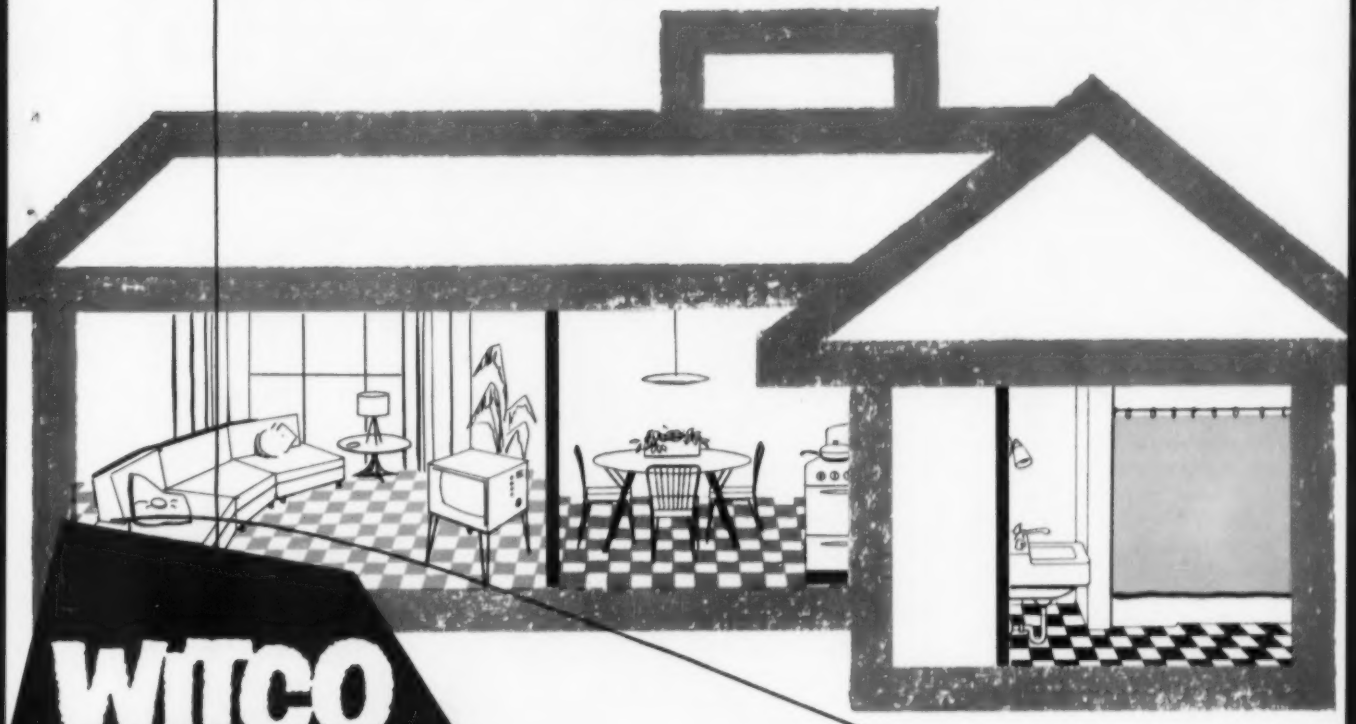
Morse G. Dial, president of Union Carbide, states that the firm proposes to erect on this site a modern 41-story building for the new home offices of the corporation and its divisions and subsidiaries. It is anticipated that the building project will involve an investment of approximately $40 million. It is hoped that the new building can be completed for occupancy some time in 1958.

Announcement of the present plans confirms the decision of Union Carbide not to go further at this time with the proposals for building facilities on its land purchased in 1952 in Westchester County. The corporation contemplates holding this land near Elmsford for future expansions appropriate to that community.

Koppers Co., Inc. has broken ground in Kobuta, Pa., for the construction of a new development laboratory where research-developed chemical and plastics products will be further tested and developed for commercialization.

Designed to give Koppers' Chemical Div. adequate facilities for short-range, urgently needed, technical activities closely related with competition and sales problems, the new laboratory will cover 43,000 sq. ft. of space. This activity will enable the company's Research Center

FOR THE MODERN WORLD OF PLASTICS . . .



WITCO

PLASTICIZERS
STABILIZERS

WITCIZER* Plasticizers are manufactured in Witco's own plants, produced to a high degree of purity and uniformity assuring quality performance in plastic formulations.

- **Phthalates (DOP, DIOP, DBP)**
- **Butyl Oleates**
- **Butyl Stearates**

STAYRITE* Stabilizers were specially developed in Witco laboratories for vinyl stabilization. There's a tailor-made STAYRITE for every vinyl formulation, including:

- **transparent formulations**
- **opaque goods**
- **plastisols**
- **organosols**
- **food-wrapping film**

35 Years of Growth

Witco invites you to bring your plasticizing and stabilization problems to our technical service staff. They have wide experience in the application of WITCIZERS AND STAYRITES to the manufacture of quality plastics.

*Trade-mark

WITCO CHEMICAL COMPANY

122 East 42nd Street, New York 17, N. Y.

CHICAGO · BOSTON · AKRON · ATLANTA · HOUSTON · LOS ANGELES
SAN FRANCISCO · LONDON AND MANCHESTER, ENGLAND

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in Verona, Pa., to devote more time to basic research and development of new products for the future.

Rohm & Haas Co. announces the completion of a new and larger building for its plastics Research and Development Laboratory in Bristol, Pa. The new structure houses engineering offices, conference room, and a design studio operated mainly for customer service; a large chemical laboratory devoted primarily to research in high-polymer systems; and a cast sheet semi-works for evaluation and limited production of experimental polymers in large size sheets.

Architecturally, the building serves as a combined testing laboratory and showcase for the company's plastics products. Advanced design is employed in the use of Plexiglas for daylight-control glazing and as a diffusing medium for large-area lighting. A luminous ceiling installed in the design studio, for example, makes use of extruded Plexiglas sheets suspended in an unconventional semi-tubular pattern to provide high quality lighting at low cost.

Monsanto Chemical Co.'s Plastics Div., Springfield, Mass., has opened a new three-story research building, doubling the division's research facilities, which contains equipment for exploratory research, process and product development, end-use research, and integrated research and technical service. Larger office and conference space for technical service functions will enable personnel to work on customers' problems in close cooperation with research scientists.

Throughout the new building plastics and plastics combinations are used for functional and decorative purposes. Contemporary furnishings make liberal use of melamine work surfaces and styrene drawer liners. Flooring materials include several compositions of vinyl tile, vinyl-bonded cork tile, and resin-bonded wood parquet. Wall surfaces in offices are painted with a recently introduced water-base paint which has improved water resistance and light stability. Polyester-fibrous glass was used as a light transmitter above metal partitions and in laboratory office walls to provide light yet maintain privacy. In addition, there are experimental installations of polyester-fibrous glass exterior windows.

Other applications include rigid vinyl luminous ceilings, acrylic chalkboards, vinyl film vapor barrier under concrete, plastic plumbing, and entry doors glazed with a new form of plastic-laminated glass which is under development for use in buildings.

Union Carbide and Carbon Corp. is building a new 26 million-lb. a year polyethylene plant near Grangemouth, Scotland. The plant will be operated by **Gemec Chemicals Co.**, a subsidiary of Union Carbide Limited. The polyethylene will be sold by **Bakelite Limited**, another subsidiary. The Scotland plant, to be completed within the next two years at a cost of $12 million, will be the first polyethylene plant built by Union Carbide in Europe.

This plant, together with four in the United States and one now under construction in Montreal, Canada, will bring Union Carbide's total polyethylene capacity to approximately 290 million lb. a year when all six plants are in operation.

British Petroleum Chemicals, Ltd., which is adjacent to the proposed Grangemouth polyethylene plant, will provide raw materials for the Bakelite plant and has announced plans for duplicating its present plant at a cost of around $17 million.

Reichhold Chemicals, Inc., White Plains, N. Y., announces the opening of a new plant in the Fairfax industrial section in Kansas City, Kan. Occupying an 8-acre plot, the plant will concentrate on production of Plyophen liquid and powdered phenolic resins.

The new structure will enable the company to supply raw materials to its customers in the vicinity who manufacture fibrous glass-resin products. A large warehouse, which includes refrigerated space, is available. Actual production at the plant is expected to be under way before the end of the year. Plans include the installation of a formaldehyde plant and eventual manufacture of RCI's full line of chemicals and resins.

The Kansas City plant, which will be managed by **L. C. Brandt,** is the 34th RCI plant in the United States and abroad. **Dr. A. L. Wooten** will be technical director. He was formerly director of phenolic research of the company's Central Div. in Detroit, Mich.

Becco Chemical Div., Food Machinery & Chemical Corp., Buffalo, N. Y., announces multi-million dollar plant expansion programs involving its hydrogen peroxide producing facilities in Buffalo and Vancouver, Wash.

The Vancouver plant will be enlarged by approximately 50 percent. The Buffalo expansion is a result of Becco's search for methods of producing hydrogen peroxide which would not be limited by such factors as the availability of electric power or certain critical materials. These efforts have culminated in the recent on-stream operation of its new non-electrolytic producing unit located at the Buffalo works. The first tank car of hydrogen peroxide produced in this plant was recently shipped to a consumer.

Alsynite Co. of America, 4654 De Soto St., San Diego 9, Calif., has broken ground for the construction of a new administration building which will face the original structure in which the company's first translucent fibrous glass panel was manufactured for commercial use.

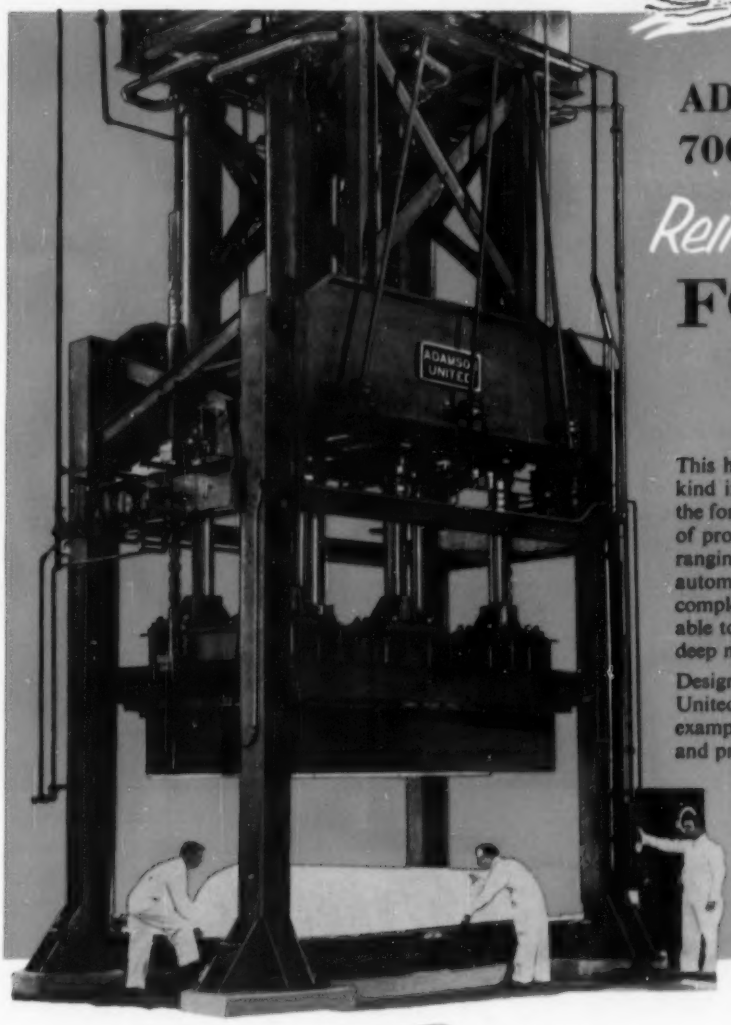
The new $40,000 building will be located at 4667 De Soto St. and will house Alsynite's administrative personnel. Additional production facilities will be expanded into former office space.

In addition to its headquarters in San Diego, the company also has manufacturing plants in Portsmouth, Ohio, and Paterson, N. J. A licensed manufacturer also operates in Australia and Alsynite is completing plans for another franchised operator in Canada.

Linde Air Products Co., a Div. of Union Carbide and Carbon Corp., announces that its new $14 million Long Reach, W. Va., silicone plant

(*To page* 274)

Now in operation at Goodyear Aircraft Corporation producing one piece plastic boat hulls...



ADAMSON'S *NEW* 700-TON Capacity *Reinforced-Plastics* FORMING PRESS

This hydraulic press, one of the largest of its kind in the world, is designed specifically for the forming of reinforced plastics. It is capable of producing a wide variety of plastic shapes, ranging from outboard motor boat hulls and automobile body components to the most complex aircraft assemblies. It is equally adaptable to the production of flat goods as well as deep molded products.

Designed, built, and installed by Adamson United engineers, this modern press is another example of Adamson's creative engineering and production facilities. Developing new machines and processes, to produce better rubber and plastic products, is our business.

Our engineering staff is at your service—no obligation.

Photograph by courtesy of Goodyear Aircraft Corporation

Another Outstanding Example of

ADAMSON'S CREATIVE ENGINEERING

SOME OUTSTANDING FEATURES

- Graduated stroke available from 0 to 138".
- Rapid approach—300" per minute.
- Pressing speed adjustable from 18" per minute to 3" per minute.
- Pressing stroke adjustable from 3" to maximum required on any known reinforced-plastic molding operation.
- Return stroke speed—200" per minute.
- Deflection, with uniform loading, less than .005".
- Mold-breaking capacity—350 tons.
- Positive safety device to prevent downdrift of moving platen, effective also when short-stroking the press.
- These and other advantages permit use on deepest molds to flat goods, with minimum cycle time. **Other presses of 300-ton capacity also in successful operation.**

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Translucent Truck...

highlights the trend to reinforced plastic body construction

shippers getting greater payloads, meeting road regulations and cutting maintenance costs

(ABOVE) Interior view of Veenama-Wiegers trailer van, made of reinforced plastic panels, molded from Celanese® Marco® Resins. Approximately 3/32" thick, these panels made by Alysynite Corp. of America, have the natural translucency of reinforced plastic, permitting easy reading of shipping labels during the day, and suggesting interesting advertising possibilities on night trips.

(RIGHT) Side view of trailer which weighs 8900 lbs., 35 feet long (several feet longer than standard trailers of the same weight), and has a loading space of 2128 cubic feet. Manufactured by Veenama-Wiegers Inc., Paterson, N. J.

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and acoustical insulation products, the company manufactures fibrous glass textile yarns and roving for

180,000 MILES WITHOUT REPAIRS TO APRONS OR OUTER BODY

One of three milk tank trucks now in operation for the Dairyman's League Cooperative Association. Built by the Heil Company, these tanks have a capacity of 4000 gallons, yet weigh several thousand pounds less than old-style carriers with similar capacity. The first of these trucks, in operation since October 1953, has traveled close to 180,000 miles without repairs to aprons or outer body. Heil is now building a 5000-gallon plastic trailer for Dairylea.

The trailer with the translucent body (opposite) is no one-time curiosity. It's a regularly scheduled, heavy duty truck that carries dry cargo thousands of miles every week. Certainly a truck that allows you to read shipping labels through its sides is different. But the difference that reinforced plastic construction makes is paying off for shippers in many other ways as well.

Insulated chemical carrier, built by Carl N. Beetle Co., Fall River, Mass., is two-ply. The reinforced plastic shell is sprayed with insulating material before outer jacket is installed. This tank trailer has a 3750-gallon capacity.

Look what a truck or trailer built of reinforced plastic can deliver: a body weight far lighter than conventional bodies—exchanging dead weight for greater payloads... resistance to weather, cold, heat, denting, moisture, stress, and vibration. Color may be permanently molded right into the material. Patch repairs can be made easily, quickly—on the road if necessary!

Sloping bottom tank truck designed by Brooks Cleveland, internationally known automotive designer, for shipping dairy products, chemicals, etc. Constructed of Celanese Marco Resins by Heil.

Celanese, producer of Marco* polyester resins, has pioneered in the development of reinforced plastic construction for trucks, boats, furniture, architectural panels, and many other products. If any of the plastic truck bodies displayed on these pages suggest profit possibilities for you, you can get more complete information from a Celanese technical representative.
Write: Celanese Corporation of America,
Plastics Division, Dept. 101-J,
290 Ferry Street, Newark 5, N. J.

Dairy Farm Pick-Up Tanks built by Heil Company, Milwaukee, Wisconsin hold up to 2000 gallons of milk. Their exceptionally fine vapor seal against deteriorating moisture is the result of a bond of insulation material and reinforced plastic into a one-piece unit. There are no joints or internal bracing to transfer heat. Stainless steel liner meets sanitary requirements.

Celanese®
PLASTICS and RESINS

On Heil trucks, color, lettering, and design are incorporated in plastic mold to become permanent part of outer surface. Heil pick-up trucks are being used by dairies and independent truckers all over the country.

*Reg. U.S. Pat. Off.

is nearing completion and production is expected to start shortly.

Several buildings have already been finished and **R. S. Abrams,** plant manager, and most of his staff have moved into the combined office and laboratory building. When presently designed facilities of the plant are in full-scale production, about 350 persons will be employed.

Linde has been engaged in research and development work in the silicone field since the late 1930's. Its plant in Tonawanda, N. Y., has been in production since 1945.

Jet Specialty Sales Co., 941 N. Eastern Ave., Los Angeles 63, Calif., which started as a one-man organization 10 years ago and which now consists of an extrusion plant, a molding plant, **Beacon Bag Co.,** Alhambra, Calif., and interest in several fabricating plants, is planning additional expansion at its present site.

Company spokesmen state that they are also planning to install specially built equipment for extruded sheet that will equal or exceed any similar facilities in the United States. Among the company's products are polyethylene, vinyl chloride, and butyrate extrusions of all kinds, including polyethylene film for bag making at the Beacon plant; polystyrene lighting fixtures of "unlimited" size; nylon rod, sheet, and injection moldings; and Teflon products.

Plek Corp., an associate company, produces injection and compression molded Kel-F products.

Bristol-Myers Co., 630 Fifth Ave., New York, N. Y., has acquired the assets of **Kimball Mfg. Corp.,** San Francisco, Calif., producer of molded fibrous glass-reinforced plastics for home, sports, and industry. The Kimball business will continue under its present name as a wholly owned subsidiary of the pharmaceutical firm. **William R. Kimball, Jr.** will continue as president of the corporation he founded in 1951.

The acquisition of Kimball will supplement another Bristol-Myers unit operating in the plastics field —**Sun Tube Corp.** (also a wholly owned subsidiary) which is doing research and development work with plastics and tubes.

Lee H. Bristol is president of Bristol Myers; **William Talbot,** one of the company's research executives, will be coordinator and liaison officer.

Lawrence Process Co., Lawrence, Mass., on the occasion of its third anniversary, announces that it is completing construction of a new plant in North Andover, Mass. The new facility will increase the company's production capacity by more than 100%, floor space from 30,000 to an eventual 150,000 sq. ft., and double employment.

Among the products manufactured by the company are plastic shoe covers to protect shoes from dirt and damage during repair, resilient polyethylene shoe counters, and polyethylene heel bases. Recently, **Shoe Patents Corp.** licensed Lawrence to extrude all plastic welts as they apply to shoes and shoe parts.

National Lead Co., through its subsidiary, **Canadian Titanium Pigments, Ltd.,** will construct Canada's first titanium pigment plant on a site near Varennes, Que., on the south bank of the St. Lawrence River about 15 miles northeast of Montreal.

The new plant is designed to meet Canada's entire requirements for titanium oxide and will cost approximately $15 million. Titanium pigments are used extensively by the paint, rubber, plastics, paper, and other industries to add whiteness, brightness, and opacity to their products.

Libbey-Owens-Ford Glass Fibers Co. is building a $435,750 modern plant in Defiance, Ohio. This is the company's second major facility in the Defiance area. Full-scale production will continue at Defiance Plant #1. **Frank Kirk,** manager of that plant, will also manage the new operation.

L.O.F. has four other plants strategically located in the United States —Waterville, Ohio; Parkersburg, W. Va.; Houston, Texas; and Burbank, Calif. In addition to thermal and acoustical insulation products, the company manufactures fibrous glass textile yarns and roving for electrical insulation and plastics reinforcement; glass mats used as wrapping for underground pipelines and as vapor barriers; and Corrulux translucent structural panels.

Bee Chemical Co., 13799 S. Avenue O, Chicago 33, Ill., has taken over the sales line of **Premier Thermo-Plastics Co.'s** vinyl extrusion and injection molding compounds, according to a joint announcement by **M. A. Self,** president of Bee Chemical, and **J. T. Boomer,** president of Premier Thermo-Plastics, which is located in Jeffersontown, Ky.

Speck Plastics, Inc., 4 Yennicock Ave., Port Washington, N. Y., has added to its present facilities a large pneumatically controlled forming press for the corrugation of Plexiglas sheeting.

The company's services now include corrugation of both C-1 and C-2½ series. In the C-1 series, sheets in sizes up to 48 by 48 in. are available, and up to 60 by 60 in. in the C-2½ series.

COMPANY NOTES

The Polymer Corp., Reading, Pa., announces that **Conrad H. Busch** has been appointed to the newly created position of advertising manager. His former affiliations were with Du Pont as a standards engineer and with The Narrow Fabric Co. where he served in public relations and as manager of research and development. **Robert B. Zimmerli** has been named sales manager of the firm's subsidiary, **National Polymer Products, Inc.** He was formerly product development and advertising manager of Polymer for over four years. Mr. Zimmerli will now handle sales of Nylasint powders for cold pressing and sintering, Nylaton powders for injection molding, and nylon coatings. **Kenneth G. Harms,** who was sales manager of National Polymer for the last two years, has been assigned as technical service manager of the parent company.

Spencer Chemical Co., Dwight Bldg., Kansas City 5, Mo., announces the following shifts in its organization: **Richard F. Brown,** general works manager, has also become a vice president. He will continue to

has taken over the duties of the dis-

THE PLASTISCOPE

be directly responsible for the operation of all the company's productive facilities and will be in a position to relieve **C. Y. Thomas**, vice president in charge of operations. Mr. Brown was appointed assistant to the vice president in 1947 and subsequently served in various capacities.

Research and development activities of the company have been established as a separate division. **Dr. John R. Brown, Jr.**, formerly general manager of research and development, has been named managing director of the new division. He joined Spencer in 1953, after having been associated with Standard Oil Development Co. and Pro-phy-lactic Brush Co.

Paul L. Weller has been appointed assistant to the vice president in charge of sales. He joined the company in 1953 as manager of market research. Prior to that time Mr. Weller was district sales manager of Wyandotte Chemicals.

Continental-Diamond Fibre, Div. of The Budd Co., Inc., Newark, Del., announces the election of **Frederick M. Grauer** as vice president. Mr. Grauer comes to Continental-Diamond from the parent company where he was associated with the New Products Dept. **F. William Jahns, Jr.** has been promoted to supervisor of a newly created Technical Sales Service.

Rohm & Haas Co., Philadelphia 5, Pa., has moved its Detroit district office to the Nor-Way Bldg., 20211 Greenfield Rd., Detroit, Mich. **R. C. Oglesby** has been named Detroit district manager, succeeding W. E. Biggers.

Mobay Chemical Co., St. Louis 4, Mo., announces that **John A. McNiff** was elected secretary of the company. **Noel V. Wood, Jr.** has been named supervisor of process engineering. Mr. Wood was formerly connected with the process engineering section of Monsanto Chemical Co.'s Organic Chemicals Div.

General Mills, Inc., Chemical Div., Minneapolis 1, Minn., has established five chemical district sales offices and named the following managers to head the respective offices: **J. H. Allderdice** will be in charge of the office at 80 Broad St., New York, N. Y.; **Melvin S. Herban** at 8047 Hamilton Ave., Detroit, Mich.; **D. E. Terry** at 612 W. 47th St., Kansas City, Mo.; and **Melvin T. Vincent** at 300 Mt. Lebanon Blvd., Pittsburgh, Pa. The other office will be at 460 South N.W. Highway, Park Ridge, Ill. The general sales office of the division will continue to be at Kankakee, Ill.

Alsynite Co. of America, 4654 De Soto St., San Diego 9, Calif., announces the following personnel changes: **Murray C. Slone** has been named technical director, **Lee H. Nelson** has joined the company as project and development engineer, and **Leonard Haslim** has joined the laboratory staff as a chemist.

National Rubber Machinery Co., Akron, Ohio, announces that sales of its non-defense equipment has set new records and that total sales are expected to exceed $10 million this year. For the first half of 1955 the company earned $314,919, or $1.61 a share, on sales of $5,882,481 against a net of $430,401, or $2.20 a share, in the first half of 1954 on sales of $5,431,000.

Steere Enterprises, Inc. has moved to larger quarters at 422 S. Broadway, Akron 8, Ohio. The company, organized in 1949, specializes in plastisol dip molding and vinyl encasing of metal objects.

Modern Pattern & Plastics, Inc., 2113 Canton St., Toledo 2, Ohio, announces that following a disastrous fire in June, the company is now undergoing extensive improvements and adding new equipment. The firm manufactures patterns and plastic tool equipment for the automotive, appliance, and aircraft industries.

The Dobeckmun Co., Cleveland 1, Ohio, converter of plastic films, foils, and papers, and manufacturer of flexible packaging materials and Lurex metallic yarn, announces the promotion of the following sales representatives on the West Coast: **Robert O. Bracken** has been named West Coast Div. sales manager, with offices in Berkeley, Calif.; **Donald H. Kerr** has taken over the duties of the district sales manager of the Oregon and eastern Washington territories, with headquarters in Portland Ore.; and **John N. Clark** is now district sales manager handling the San Francisco and northern California territories.

Aristocrat Plastics, Inc., has moved to new and larger quarters, consisting of a showroom, plant, and warehouse, at 23-25 Sussex Ave., Newark, N. J., where the company will distribute Plexiglas and other plastic materials in sheets, rods, and tubes. Aristocrat will also have facilities for custom fabrication.

Horace Blackman Co. and its manufacturing affiliate, **Blackman Plastics, Inc.**, Culver City, Calif., have created a new experimental-developmental section.

The manufacturing unit, Blackman Plastics, fabricates tank liners, fume exhaust systems, special lab sinks, and other industrial installations from both rigid and flexible materials. It specializes in deep drawing all kinds of plastics sheet materials.

Tom Parker is in charge of all over-all production of Blackman Plastics and **Camille Castaing** heads the new experimental-developmental section.

Ambassador Plastics & Mfg. Corp., 620 N. Michigan Ave., Chicago 11, Ill., announces that its new plant is located at 308 W. Erie St., Chicago. The company molds expandable polstyrene for packaging and other applications.

International Processes, Inc., 624 S. Michigan Ave., Chicago 5, Ill., through its new division, **International Researchers Associated**, offer a complete European industrial and scientific research program for American companies. The firm has permanent offices in Genoa, Italy, and consultants in eight European countries.

This international research and service program is directed by **James S. Ross**. He is a representative in the United States for various European patents and processes.

Some of the services offered by the organization are: foreign market research; investigation of trade channels to obtain qualified distributors for handling of United States products; product and process investigation; review of foreign scientific

Mechanical Sculptor

CARVES BIG MOLDS

With feather-light touch, the tracer of this huge die sinking machine passes over the surface of a master pattern. The slightest change in contour is transmitted by a varying electric current to the cutter, which faithfully reproduces every intricate detail of the pattern in the mold cavity.

From the mold shown, Bridgeport Moulded Products Co., Inc. produced the handsome grille of the Philco air conditioner pictured in the inset—one of the hundreds of fine products for which molds have been created by the skilled hands and modern facilities at Newark Die Company.

Big molds have been a big factor in the growth of the plastics industry. For more than 30 years Newark Die has led in the design and construction of all types of molds.

Write for free booklet "Solving Big Mold Problems"

NEWARK DIE COMPANY

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and trade publications for current articles pertaining to client's business; patent search and abstracts translations; attendance at foreign trade fairs, exhibits, meetings; securement of latest literature; and arrangements for technical and laboratory research abroad and in the United States.

Chemical Products Corp., East Providence, R. I., has appointed **Gossett & Hill Co.**, 7185 W. Bloomingdale Ave., Chicago 35, Ill., as its distributing agent for Chem-o-Sol (vinyl plastisols) and Nelco lacquers for plastic moldings in Illinois, Indiana, Wisconsin, and metropolitan St. Louis, Mo. **Edward Moran**, of Chemical Products, will operate as technical representative out of the offices of Gossett & Hill.

Package Machinery Co., East Longmeadow, Mass., announces the election of **Lewis A. Curtis** as vice president in charge of sales. He was formerly general sales manager of the company.

Roger L. Putnam, chairman of the board, had been acting as temporary director of sales, a job he now relinquishes so that he may devote more time to the company's **Reed-Prentice Div.**, Worcester, Mass. Mr. Putnam is president of this subsidiary.

Bassons Industries Corp., 1432 West Farms Rd., New York 60, N. Y., announces that **Harold B. Hill** has been appointed executive assistant to the president and **William D. Claypool** as executive director. Mr. Hill was formerly director of transportation and equipment of the Atlantic Division, United States Navy. Mr. Claypool was formerly president of Wm. D. Claypool Corp. and an industrial specialist for the War Dept.

Continental Can Co., 100 E. 42nd St., New York 17, N. Y., announces the following appointments: **D. N. Rabishaw** has been named manager of purchases for coatings and chemical products. He will be responsible for the company's contract purchasing and general policy determinations on the following group of products: coatings and enamels; adhesives; chemical products; lithograph and printing inks; plastic resins for molding, extrusion, and casting; cellophane and plastic films; can end sealing compounds; seam cements; and fluxes and foil.

Dr. Frederick W. Adams has been appointed director of the department of chemistry of Continental's central research and engineering division. Dr. Adams was formerly research and development director of the company's **Millsplastic Div.**

The Landers Corp., Toledo, Ohio, has expanded its sales department with the addition of **W. A. Andrews III, Neil McPhail**, and **Richard A. Potter.** Mr. Andrews has been assigned to general sales service and Mr. McPhail to distributor and automotive sales service; Mr. Potter has been named special sales representative to the distributor trade and assistant to **R. D. Townsend**, manager of distributor sales.

Trulon Corp., 78-01 Queens Blvd., Elmhurst 73, N. Y., has been recently formed and will engage in the molding of plastics, primarily nylon hardware for the industrial trade. The firm also offers it services as a consultant on plastic problems. **Bernard Schiller** is president of Trulon.

Consoweld Corp., Wisconsin Rapids, Wis., has named **Delbert G. Rowland** field representative for the Mid-Central States and **Thomas J. Durkin** for the East Mid-Central States.

Wheelabrator Corp., Mishawaka, Ind., is the new name of the firm formerly known as American Wheelabrator & Equipment Corp. There is no change in ownership, management, or operation of the company which manufactures equipment for blast-cleaning, dust and fume control, and foundry work.

Amco Plastic Materials, Inc., 80-96 Fourth St., Brooklyn 31, N. Y., is a new company formed by **Arthur L. Metzger** and **Matthew T. Staszak.** The firm will buy, sell, and process all types of primary and secondary thermoplastic materials, as well as surplus and job lots. Both Mr. Metzer and Mr. Staszak were formerly associated with A. Bamberger Corp. and American Molding Powder & Chemical Corp., Brooklyn, N. Y., and held the respective positions of vice president in charge of sales and vice president in charge of production.

Gilbert Plastics, Inc., 1415 Chestnut Ave., Hillside, N. J., manufacturer of plastic containers for the produce and food industries, has named **Twinpak, Ltd.**, 6525 Somerled Ave., Montreal, Que., as its Canadian distributor. A branch office of Twinpak is located at 131 Avenue Road, Toronto, Ont.

Gilbert Plastics is the producer of the patented Seequal-Pak plastic tomato trays which permit customers to examine tomatoes without handling.

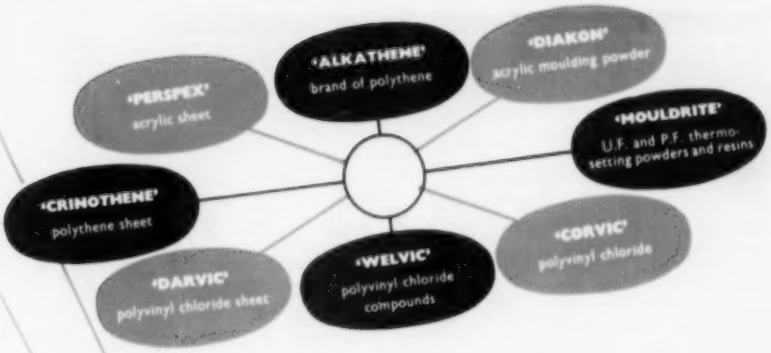
L. O. F. Glass Fibers Co., Toledo, Ohio, announces the following appointments in its regional offices: **John B. Banks** has been named sales manager for the Central region, with offices at 18263 Hartwell at James Couzens Highway, Detroit, Mich.; **Ned P. Kimberly** is now district manager for the Cleveland area and will have his headquarters at 8905 Lake Ave., Cleveland, Ohio; **Robert E. Simpson** has been appointed sales manager for the Southwest region, with headquarters in Houston, Texas; and **Robert N. Heyman** district manager of the Dallas territory; **H. Matthew Bowers**, formerly quality control manager of the Parkersburg plant, has been promoted to general quality manager of the company in Toledo; **Calvin A. Calendine** succeeds Mr. Bowers at the Parkersburg plant. **Ken C. Settelmyer** is now Midwest sales manager and will headquarter at 230 N. Michigan Ave., Chicago, Ill.; and **Thomas L. Carver**, formerly New York district manager of the company's Fiber Glass Div., has been named sales manager for the Eastern region, with offices at 441 Lexington Ave., New York, N. Y.

George Woloch Co., Inc. has moved to new and larger quarters at 601 W. 26th St., New York 1, N. Y.

Correction

Visking Corp. has called attention to an error which appeared in this column in the August issue regarding **Leslie E. Houck's** appointment. The correct information is as follows:

Mr. Houck was named to fill a vacancy on the board of directors of the parent company, which was oc-



European Guide to I.C.I. Plastics Division Agencies

The wide range of plastics materials manufactured by Imperial Chemical Industries are sold in Europe through the agencies listed here. First-class Technical Service and Advice, before the sale and afterwards, are available to all who wish to make use of them.

All I.C.I. plastics materials are not handled by all the agents, but any agent will re-direct enquiries.

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Plastics Division, Black Fan Road, Welwyn Garden City, Herts., England.

U.S.A. enquiries to:
J. B. Henriques, Inc., 521 Fifth Av., New York, 17, N.Y.

Canadian enquiries to:
Canadian Industries (1954) Ltd., Plastics Dept., Box 10, Montreal, P.Q.

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STOCKHOLM

NORWAY
Keddell and Bommen A/S
Postboks 190
OSLO

DENMARK
Ringsted and Semler
Nørre Farimagsgade 13
COPENHAGEN, K

GERMANY
Allgemeine Industrie-Commerz
Walter von Weizenbeck
MUNICH 13
Georgenstrasse 7

HOLLAND
Imperial Chemical Industries (Holland) N.V.
Wijnhaven 107, P.O. Box 551
ROTTERDAM

BELGIUM
Imperial Chemical Industries (Belgium) S.A.
Shell Building—Bureau 408
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Imperial Chemical Industries (France) S.A.
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casioned by the death of J. Paul Smith. Mr. Houck also continues in office as vice president and general manager of **Visking, Ltd.**, Lindsay, Ont.

In addition to Mr. Houck's appointment, the board membership was increased to 12 and **E. B. Cahn**, general manager of Visking's Plastics Div., was named to fill the extra place.

PERSONAL

J. Boyd Britton has been elected vice president of operations of **Godfrey L. Cabot, Inc.**, 77 Franklin St., Boston 10, Mass. Mr. Britton will administer and coordinate the work of the departments of research and development, personnel and organization, technical service, and public relations, as well as production planning and control, and sales service of the company.

Paul S. Foster has been named manager of **The Dow Chemical Co.'s** San Francisco, Calif., office. The office services markets in central and northern California, Nevada, and Utah.

C. MacHenry has been appointed section leader of **Shell Chemical Co.'s** product section, which is concerned with the manufacture of plastics and resins, especially Epon resins and related products.

Wallace E. Gordon, formerly director of sales of **Du Pont's** Grasselli Chemicals Dept., has been appointed director of the company's Advertising Dept. He succeeds William A. Hart, who retired after 31 years' service with Du Pont.

General John E. Hull, U.S.A., (Ret.), former United States and UN commander-in-chief in the Far East, has been elected president of **Manufacturing Chemists' Association, Inc.**, Washington 6, D. C. He succeeds William C. Foster who resigned.

After 37 years' service General Hull retired from the Army in April 1955. Among other assignments he has served as a member of the executive committee of the Research Board for National Security and was in charge of and conducted the test of atomic weapons for the Atomic Energy Commission at Eniwetok Atoll.

Bruce A. Robertson has been named manager of plastics operations of **American Optical Co.**, Southbridge, Mass. Mr. Robertson's former affiliations were with General Tool Co., Worcester Molded Plastics Co., and Gilbert Plastics Co.

Don R. Matthiesen has been promoted to sales manager of **The Plas-Tex Corp.**, 2525 Military Ave., Los Angeles 64, Calif., manufacturers of plastic housewares. Mr. Matthiesen has been associated with the company for four years.

Lloyd F. Storie has been elected a vice president of **The Vichek Tool Co.**, 3001 E. 87th St., Cleveland 4, Ohio. Mr. Storie will continue to act as company secretary and as a director, posts he has held since 1951. He came to the company in 1946 in a sales capacity after playing professional hockey with the Cleveland Barons.

Ted Sandelius has been appointed sales engineer to direct the newly expanded Custom Coating Dept. of **Tube-Kote, Inc.**, Houston 25, Texas.

The Custom Coating Dept. provides TK-2 plastic, Teflon, and other plastic linings for such items as petro-chemical equipment, storing-cooking-mixing tanks, chemical handling equipment, piping and processing equipment, valves, compressors, hydraulic units, laundry equipment, and various types of liquid-carrying equipment used in Gulf Coast industries.

Berkeley A. Cater has been named sales manager of **Jersey Plastic & Die Casting Co.**, 149-55 Shaw Ave., Irvington 11, N. J. The company is engaged in zinc and aluminum die casting, as well as compression and injection molding with machines up to 200 ounces.

Merrill R. May has been appointed research manager of **Glass Fabrics Finishing Corp.**, a subsidiary of **Hess, Goldsmith & Co., Inc.**, 1400 Broadway, New York, N. Y. His primary assignment will be the development of new finishes for decorative and industrial glass fabrics. Mr. May was formerly associated with Irvington Varnish and Sun Chemical in the formulation of printing inks, coatings, and finishes for plastic films and textiles.

Ernest Port has joined **Brunswick-Balke-Collender Co.'s Reinforced Plastics Div.**, Marion, Va., as project engineer. He was previously connected with Goodyear Aircraft Co.'s Canopy and Laminate Div.

Gerry P. Mack, formerly vice president of Advance Solvents, Inc., has joined **M & T Laboratories, Inc.**, a subsidiary of **Metal & Thermit Corp.**, 100 E. 42nd St., New York 17, N. Y.

M. W. Burkhart has been elected vice president of **Lincoln Plastics Corp.**, Circleville, Ohio. He joined the company in 1951 as manager of Lincoln's former plant in Cambridge, Ohio, and in June 1954 was appointed sales manager. Mr. Burkhart will continue to serve in this capacity with added responsibilities in the firm's advance engineering-planning department.

Robert B. Battersby, chief engineer of the **Thermosetting Div.** of **Auburn Button Works, Inc.**, Auburn, N. Y., has been promoted to manager of the division. He succeeds **John H. Woodruff**, vice president, who has assumed duties of a broader corporate nature.

C. Wyatt Smythe has joined the sales department of **Resistoflex Corp.**, Belleville, N. J. Mr. Smythe will be responsible for coordinating the company's field sales operations, market research, sales forecasting, and other activities of the department.

William F. Condon has been named general sales manager of **Spun-Lite Corp.**, manufacturer of corrugated fibrous glass panels. Mr. Condon will head the sales offices at 7395 N.W. 34th Ct., Miami, Fla., and 99 Park Ave., New York, N. Y. He was formerly associated with Virginia-Lincoln Corp., Marion, Va., and with Owens-Corning Fiberglas Corp.

George A. Cabaniss has joined **The Borden Co.'s Chemical Div.** as general manager of its Polyco Dept. plant in Illiopolis, Ill. He replaces **Richard Pease** who will return to

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Borden's Polyco plant headquarters in Peabody, Mass. For the past five years Mr. Cabaniss has been general foreman of B. F. Goodrich Chemical Co.'s synthetic rubber plant in Louisville, Ky.

Major production at the Illiopolis plant includes polyvinyl acetate, butadiene-styrene, and butadiene-acrylonitrile.

William H. Cox is now plant manager of **Shaw Insulator Co.**, 160 Coit St., Irvington 11, N. J.

Francis A. Jones has been promoted to manager of production control of **Bolta Products**, a **Div. of The General Tire & Rubber Co.**, Lawrence, Mass. Mr. Jones formerly served as purchasing agent, a position which has been filled by **Wayne Grubaugh.**

Wallace S. Frank has been named supervisor of the Process Development Unit of **General Electric Co.'s** Silicone Products Dept., Waterford, N. Y.

John C. Coonley has been elected president and a member of the board of **The Hydraulic Press Mfg. Co.**, Mt. Gilead, Ohio. Until January of this year, Mr. Coonley was general manager of the Valve Div. of A.C.F. Industries, Detroit, Mich.

Fred Elmer has been appointed manager of the new Vinyl Film and Plastic Sheeting Dept. of **A. Bamberger Corp.**, 703 Bedford Ave., Brooklyn 6, N. Y. He will handle sales of plain, printed, and embossed lightweight vinyl film and heavy-gage sheeting.

Edward W. Maass has resigned from American Optical Co. to establish his own business as an engineering consultant to the plastics industry. Mr. Maass is located at East Hampton, Conn., Box 73.

Dr. Daniel W. Elam heads the newly established **Adhesives Engineering Div.** of **Hexcel Products, Inc.**, 951 61st St., Oakland, Calif. Dr. Elam is experienced in the field of metal and sandwich adhesives, having spent the past 13 years in charge of plastics application research at Shell Development Co. During this time, he directed the Shell government-sponsored Epon resin work in potting, laminating, and adhesives—a result of which was the development of Formula 422 for the USAF. The new division marks Hexcel's entry into the production of adhesive products for general industrial use.

Dan B. Hains, formerly vice president in charge of sales of **Russell Reinforced Plastics**, Lindenhurst, N. Y., has resigned to become a merchandising consultant. He will conduct his business from his home in Bayville, N. Y.

Howard H. Ward has been named controller of **Ball Brothers Co., Inc.**, Muncie, Ind., manufacturer of glass containers, metals, plastics, and rubber products. One of the company's subsidiaries is **Kent Plastics Corp.**, Evansville, Ind.

Dr. Desmond M. C. Reilly has been appointed sales promotion and publicity manager of **Food Machinery & Chemical Corp.'s Chemical Divs.**, 161 E. 42nd St., New York 17, N. Y.

Adolph J. Kissileff has resigned as president of Amplex Mfg. Co., 2325-31 Fairmount Ave., Philadelphia 30, Pa.

A. Carl Schmidt has been named assistant to the sales manager of **The Arthur Colton Co.**, 3400 E. Lafayette Ave., Detroit 7, Mich., manufacturer of pharmaceutical, packaging, plastics, and chemical industry machinery.

William S. Landes, former vice president of Celanese Corp. of America, is in Japan as a management and engineering consultant for the International Cooperation Administration, 806 Connecticut Ave., N.W., Washington, D. C. He will act as advisor on management-engineering problems to top executives of many of Japan's leading industrial firms.

Arthur N. Williams, for 10 years general sales manager of General American Transportation Corp.'s Plastics Div., Chicago, Ill., has been appointed president and chief executive officer of **Haskelite Mfg. Corp.**, Grand Rapids, Mich. He succeeds **George H. Redlin**, who has been named chairman of the board. Prior to his affiliation with GATX, Mr. Williams served in a similar capacity with Eclipse Mfg. Co., Milwaukee, Wis., which was acquired by General American in the post-war period as part of the company's expanding activities in the plastics field.

Dr. Harold Zinnes has joined the **Technical Div.** of **The Baker Castor Oil Co.**, 120 Broadway, New York 5, N. Y. He has been assigned to the research department for the development of new products.

John C. Hagerty has joined the sales staff of **Lyna Plastics, Inc.**, 3200 Camargo Rd., Madeira, Ohio, a subsidiary of **Dualite Displays, Inc.**, Madisonville, Ohio. Lyna Plastics fabricates thermoplastic sheets for display packaging, light diffusers, and industrial applications.

S. Ken Tyson has been named assistant manager of **Archer-Daniels-Midland Co.'s** Chicago, Ill., office. **Thomas R. Procter**, former head of Procter & Johnson, is manager of the A-D-M Chicago office.

William Blalock has been named West Coast technical representative for stearates for **Witco Chemical Co.**, 122 E. 42nd St., New York 17, N. Y.

John J. Miller has been named Midwestern representative of **Surface Chemicals, Inc.**, McKees Rocks, Pa. He will work exclusively with industry in the development and application of specialized coatings for all types of applications, including fire-retardant mastics, epoxy films, adhesives, fillers, and polyurethane foaming resins for insulation and acoustical uses.

Otto Hansen is now chief engineer of the **Fiberglass Div.** of **Olympic Plastics Co., Inc.**, 5741 W. Jefferson Blvd., Los Angeles 16, Calif. Mr. Hansen has served at Wright Field on reinforced plastic parts during World War II and has since served with various airplane producers in their reinforced plastics engineering groups.

Carlton H. Gilbert has been named director of advertising of **U. S. Rubber Co.**, succeeding Thomas H. Young who retired after 39 years with the company.

Ethel H. Drachsler has joined **Toscony Fabrics, Inc.**, 303 Fifth Ave., New York 16, N. Y. Miss Drachsler formerly operated her own studio

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where she was active in the styling of vinyl plastic film.

Edward A. Coleman has been named Eastern district representative of the **Closure and Plastics Div., Owens-Illinois Glass Co.**, Toledo 1, Ohio.

H. Stanley Lawton is now sales manager of container and chemical specialty products of **Dewey & Almy Chemical Co., Div. of W. R. Grace & Co.**, Cambridge 40, Mass.

Dr. Frederick F. Pollak, a chemist who originally came from Austria, was presented with the Carl Freiherr von Auer-Welsbach medal for his outstanding achievements in the field of synthetic resins. The medal, which was donated for pioneer work of lasting significance in the advancement of the chemical industry has thus far been awarded only six times. The award to Dr. Pollak was made by the Austrian General Consul in New York, N. Y.

Deceased

Dr. William J. Hale, prominent Dow scientist, died at the age of 79. He was instrumental in the development of many chemical processes, and was the father of the science of chemurgy which he defined as "the direction of nature's life agencies to the production of chemicals for industry."

MEETINGS

Plastics Groups

Oct. 13-14—The Society of the Plastics Industry, Inc., New England Section Meeting, Equinox House, Manchester, Vt.

Dec. 6-7—The Society of the Plastics Industry, Inc., Sixth S.P.I. Film, Sheeting and Coated Fabrics Division Conferences, Hotel Commodore, New York, N. Y.

Feb. 7-9, 1956—The Society of the Plastics Industry, Inc., Eleventh Annual S.P.I. Reinforced Plastics Division Conference, Hotel Chalfonte-Haddon Hall, Atlantic City, N. J.

March 8-9—The Society of the Plastics Industry Canada, Inc., Fourteenth Annual S.P.I. Canadian Con-

ference, Sheraton-Brock Hotel, Niagara Falls, Ontario, Canada.

June 11-15—The Society of the Plastics Industry, Inc., Seventh National Plastics Exposition, New Coliseum, New York, N. Y.

Other Meetings

Oct. 8-16—Associations of the German Plastics Trade, Trade Fair and Production Exhibition, Exhibition Centre, Ehrenhof, Germany.

Oct. 13-15—Committee on Vacuum Techniques, Inc., Second Symposium on Vacuum Technology, Mellon Institute, Pittsburgh, Pa.

Nov. 8-10—Packaging Association of Canada, Fourth Canadian National Packaging Exposition and Banquet, C.N.E. Automotive Bldg., Toronto, Ont.

Nov. 14-15—The Chemical Market Research Association and Commercial Chemical Development Association, Joint Meeting, Hotel Carter, Cleveland, Ohio. Subject: "Chemical Fibers."

Nov. 14-15—TAPPI National Plastics Meeting, Brooklyn Law School, Brooklyn, N. Y. Theme: "Fibres and Plastics for Laminates."

Nov. 16-18—Society for Experimental Stress Analysis, Annual Meeting, Hotel Sheraton, Chicago.

Nov. 27-30—American Chemical Society, Ninth National Chemical Exposition, Public Auditorium, Cleveland, Ohio.

Nov. 27-30—American Institute of Chemical Engineers, Annual Meeting, Statler Hotel, Detroit, Mich.

Dec. 5-9—International Exposition Co., New York, N. Y., Twenty-fifth Exposition of Chemical Industries, Commercial Museum and Convention Hall, Philadelphia, Pa.

Dec. 6-8—Signal Corps Engineering Laboratories and the Wire and Cable Industry, Fourth Annual Symposium on "Technical Progress in Communication Wires and Cables," Berkeley-Carteret Hotel, Asbury Park, N. J.

Feb. 22-March 2, 1956—British Industrial Fair Ltd., British Fair, Earls Court, London, England.

Feb. 27-March 2—American Society for Testing Materials, National Meeting, Hotel Statler, Buffalo, N. Y.

CLASSIFIED ADVERTISEMENTS

MODERN PLASTICS reserves the right to accept, reject or censor classified copy.

EMPLOYMENT • BUSINESS OPPORTUNITIES • EQUIPMENT (used or resale only)

MACHINERY and EQUIPMENT FOR SALE

STOKES 150 ton semi-autom. hydr. press. Kux 2½" dia. single punch Preform Machine. Leominster 8 oz. injection Molding Machine. Plastic and Rubber Equipment. Farrell 16"x48", 15"x36" and 6"x12", 2 roll mills. Mills and Calenders up to 84". New Seco 6"x12" and 6"x14" Lab. Mixing Mills and Calenders. Plastic & Rubber Extruders. Wat.-Stillman 75 ton automatic Molding Press 20"x20" platens. 200 ton Hobbing Press 18"x14" platens. HPM 200 ton 30"x48" platens. New Loomis 340 ton, 24"x56" platens. Robertson 150 ton, 24"x24" platens. Adamson 100 ton, 20"x20" platens. Farrel 200 ton, 26"x30" platens. Southwark 30 ton 14"x14" platens, semi-auto. Also Lab to 2000 tons from 12"x12" to 48"x48". Hydr. Oil Pumps. Gould 75 HP motor Dr. 2 stage Centrif. Pump 250ø. W.S. 4 Plgr. High and Low Pressure Hydr. Pump. Elmes Hor. 4 Plgr. 4500 lbs. and 5500 lbs. Hydr. Accumulators. Stokes Automatic Molding Presses. Rotary & single Punch Preform Machines ½" to 4". Injection Molding Machines 1 oz. to 32 oz. Baker Perkins Jacketed Mixers. Plastic Grinders. Heavy duty mixers, gas boilers. Partial listing. We buy your surplus machinery. STEIN EQUIPMENT CO., 167—8th Street, Brooklyn 15, N.Y. STerling 8-1944.

FOR SALE: 3—National 10"x20", 6"x14" Two Roll Mills; 3—Baker Perkins 100 gal., 50 gal. jacketed double arm Mixers; 2—Stokes Rotary Preform Presses DD8 2, D3; 3—Stokes Model "R" single punch Preform Press; 1—Kux Model 15-25 double action Rotary Press; 2—Cumberland #0 Rotary Cutters; Also: Sifters, Cutters, Banbury Mixers, etc., partial listing; write for details; we purchase your surplus equipment. BRILL EQUIPMENT CO., 2407 Third Ave., New York 51, N. Y.

FOR SALE: Injection Molding Machines, 22 oz. IMPCO, 16 oz. H.P.M. Late type machines, 9 oz. H.P.M., 8 oz. W. & S., 4 oz. De Mattia, 1 oz. Sav-Way. Mod. 252 Stokes closure press, Ball & Jewell plastic grinders. AARON MACHINERY CO., INC., 45 Crosby Street, New York 12, N. Y.

FOR SALE: Stainless Steel Rotary Dryer. Link Belt Co., 5'2"x16", No. 502-16, with all auxiliary equipment. Roto louvre also 6'x24' and 5'x26'. Hersey Stainless Steel Rotary Driers. Reply Box 1037, Modern Plastics.

SAVE WITH GUARANTEED REBUILT EQUIPMENT: HYDRAULIC PRESSES; compression molding Dunning & Boschert 2—12" ram 170 ton, 2—10" rams 118 ton—Baldwin Southwark 4—26"x26" 8" ram, 75 tons; 5—26"x26" 7" ram 57.7 tons; 5—15"x15" 8" ram, 75 tons; 4—14"x14" 8" ram, 75 tons; 2—19"x24" 10" ram, 75 tons; 18"x18" 7" ram, 57.7 tons; 3—12"x12" 7½" ram, 66 tons; 8"x9", 4½" ram, 20 tons; D&B 12"x12" 3" ram, 10 tons: LABORATORY PRESSES: Carver 6"x6" 10 ton, W&S 6"x6" 20 tons; Preform Presses 5½T Colton and Stokes R, M.D.; NEW UNIVERSAL DUAL PUMPING UNITS, 3-15 HP; NEW LABORATORY MILLS AND CALENDERS, also extruders, mixers, vulcanizers, injection molding units, etc. UNIVERSAL HYDRAULIC MACHINERY CO, INC., 285 Hudson Street, New York 13, N. Y.

FOR SALE: 1—Royle #4 Extruder, motor driven; 1—6"x12" Laboratory Mill, m.d.; 1—Ball & Jewell Rotary Cutter, size O m.d.; 2—Baker-Perkins Size 15, 100 gal. Jacketed Mixers; 5—Horizontal Dry Powder ribbon Mixers, 4000#, 1500#, 500#; 1—New 3 Roll 6"x16" Laboratory Calender; 1—Farrell-Birmingham 60" Mill with reduction drive, 150 HP motor, floor level mounting; 1—Fitzpatrick "D" Comminutor, S.S. contact parts, jacketed; 1—Mikro Pulverizer #2th, with motor; 4—Reed Prentice & W-S Injection Molding Machines, 2-16 oz.; Also other sizes: Hydraulic Presses, Tubers, Banbury Mixers, Mills, Vulcanizers, Calenders, Pellet Presses, Cutters. Send us your inquiries. What have you for sale? CONSOLIDATED PRODUCTS CO., INC., 50 Bloomfield Street, Hoboken, N.J. HOboken 3-4425, N.Y. Tel.: BArclay 7-0600.

(6) 4 OZ. LESTERS, 1953, fully automatic, $55,000. 60 oz. H.P.M.; 48 oz. DeMattia, fully hydr. 40 oz. H.P.M., $28,000; 32 oz. Lester, 1956, $22,000. 32 oz. Reed-Prentice, 1950, $26,500; 24 oz. Reed-Prentice, 1950, $17,500; 22 oz. Impco w/transfer plunger; 16 oz. H.P.M., $9,000; 16 oz. Watson-Stillman, $16,500; 12 oz. Impco vert., $8,000; 12 oz. DeMattia, 1952, $10,500; 12 oz. Reed-Prentice, 1952, $14,500; 12 oz. Lester, $7,500; 9 oz. H.P.M., 1946, $5,500; 9 oz. H.P.M., 1943, $4,000; 8 oz. Reed-Prentice, 1946, $6,500; 8 oz. Reed-Prentice w/10 oz. cyl., $8,500; 8 oz. Reed-Prentice, 1948, w/plunger advance, $7,500; 8 oz. Lester, 1950, $7,750; 6 oz. Reed-Prentice, $3,500; 6 oz. Lester, $4,000; 6 oz. Heisgen, $1,850; 4 oz. H.P.M., $3,350; 4 oz. Impcos w/larger cyl., $5,500; 4 oz. Lewis, 1953, $5,000; 4 oz. Lester vert., $4,500; 4 oz. Lester, $3,250; 3 oz. Fellows, $6,500; 2 oz. Van Dorn, lever type, $1,750. powder mixers, $315; 150 ton Stokes closure presses; 150 ton Stokes w/high speed trans. ram; 235-A Stokes; (11) 22 ton compression presses, self-contained, $1,250 each; grinders w/8½"x10" throat, reasonable. Small plant near Worcester, Mass. with one 8 oz. Reed-Prentice machine and building —$18,000. ACME MACHINERY & MFG. CO. INC., 102 Grove Street, Worcester, Mass. Tel.: PLeasant 7-7747.

FOR SALE: (11) 75 ton record presses, complete @ $2,450, (11) new 100 ton, 10" ram, 10" stroke @ $1,100, (8) 200 ton, 9" stroke, 14" ram, 36x36 @ $1,850, (7) 200 ton, 9" stroke, 15" ram, 30x30 @ $1,650, (1) 50 ton complete, 18x18 @ $1,850, (1) 200 ton, 16" ram, 30x30 @ $2,450, (2) 200 ton, 16" ram, 42x42 @ $2,850, (1) 200 ton, 15" ram, 42x42 @ $2,450, (4) 250 ton, (2) 12" rams, 30x60 rebuilt @ $3,375. HYDRAULIC SAL-PRESS CO., INC., 388 Warren Street, B'klyn, N. Y.

FOR SALE: Hobbing Press 800 Ton W.S. (2) 300 Ton W.S. Presses 20x20 & 29x24 Platens. 140 Ton W.S. 22x16 Platen. 85 Ton Waterbury Farrel 20x24 Platen. 60 Ton Press 15x15 Platen with Pullback Cyls. 9, 8, 4, Oz. Injection Molding Machines. 15 Ton Lab. Presses 10x8 Platen. 10 Ton Lab. Presses 6x6 Platen Ball & Jewell Plastic Grinders. Standard Mystic Embossing Presses, Accumulators, Pumps, Valves. Many other Presses—Send For Bulletin. No. 252 Stokes Closure Press, 700 Ton National Erie 38x38 platens, 250 Ton W&S 28x24 Platens, 113 Ton Farrel 36x36 Platens, 80 Ton Farrel 24x24 Platens. AARON MACHINERY CO., INC., 45 Crosby St., New York 12, N.Y. Tel.: WAlker 5-8300.

AVAILABLE AT BARGAIN PRICES

Mitts & Merrill 15CD Rotary Cutter. J. H. Day, from ¾ up to 100 gal., Imperial and Cincinnatus D. A. Jacketed, Sigma Blade Mixers. Day 15 to 10,000 lbs. Dry Powder Mixers. Baker Perkins Heavy Duty (Steam Jacketed) Double Arm, from 5 to 200 gal., Mixers (Unidor and Vacuum also). Gemco 2000 lbs. 56 cu. ft. Double Cone Blender. Mikro Bantam, 18H, 2TH, 3W, 3TH, 4TH Pulverizers. Day, Rotex, Tyler Hum-mer, Robinson, Raymond, Gayco, Great Western Sifters. Colton 2RP and 3 RP Rotary & #5½ Tablet Machines. Carver Laboratory 20 ton hydraulic Press. Package Machy. FA, FA2, FA4, U4, Miller, Hayssen, Wrap-King, Scandia, Oliver Auto. Wrappers—all sizes. This is only a partial list. Over 5000 machines in stock available for immediate delivery. Tell us your machy. requirements. UNION STANDARD EQUIPMENT CO., 318-322 Lafayette St., New York 12, N. Y.

FOR SALE: (2) W&P 100 gal. Double Arm Sigma Blade Jacketed Mixers; (1) Day 30 gal. same. (2) Kux Rotary Pellet Presses, model 25, 21 and 25 punch; (1) Stokes RD-3. PERRY EQUIP. CORP., 1429 N. 6th St., Phila. 22, Pa.

FOR SALE: Abbott Vacuum Forming Machine 30"x30' fully automatic with blower. Two working tables, ½ horse router with cutters. 900 lbs. plastic, asst. sizes. ¼ inch drill and silk screen supplies. Illness. Will take any reasonable offer. JOHN SAIONZ, 617 Adams St., Toledo, Ohio, Second Floor.

BUTTONDEX MACHINES: Slightly used machines for sale at bargain prices. Reply Box 1004, Modern Plastics.

EXTRUDER: Latest model like new: 1½ and 2½ both electrically heated, Vari-drive motor, air cooling, pyrometer control panel. One complete polyethylene lay flat blown tubing unit, haul-off, wind-up one small, one large blown film die. One take-off conveyor. One tubing dual spooling machine. One complete wire covering take-up and cooling, capstan and pay-off stand. Reply Box 1018, Modern Plastics.

FOR SALE: One 48" High Vacuum Coating Machine equipped with 2 large diffusion pumps, a booster pump, inside rotating mechanism, transformer and filament bars. In excellent working condition. Reply Box 1029, Modern Plastics.

FOR SALE: 200 T. Fastraverse HPM Fiberglass press 84"x66" Pl. Williams & Turner Preformers—Injection Presses: 4, 8, 12, 24, 32 oz. Reeds. 2, 4, 9 oz. HPM. 32 oz. Vertical HPM. 8, 12, 20 oz. Lesters. 12 & 48 oz. Watson. 1, 2 oz. Van Dorn. Extruder: RC 65 Twin-Screw Stokes—Windsor. Scrapgrinders. Ovens. Meridian Temp. Circulator. Compression Presses: 50 to 600 Tons. Stokes-Standards 50 Tons. Stokes Automatics 15 tons. Preform presses. 30 HP Gasboiler. Auto-Vac Vacuum Form. mach. 52"x30". 200 T. Hobbing Press. List your Surplus Equipment with me. JUSTIN ZENNER, 823 Waveland Ave., Chicago 13, Ill.

FOR SALE: By-the-machine grinders with large throat & other special features. Priced very low. For details contact ACME MACHINERY & MFG. CO., 102 Grove St., Worcester, Mass. Tel. Pleasant 7-7747.

FOR SALE: 60 oz. H.P.M. Injection Machine. Fully Equipped With Timers. Wheelco Instruments, Control Panels Etc. Used Very Little, In First Class Condition. Can Be Seen In Operation. Also 4 oz. Machine Available. Reply Box 1031, Modern Plastics.

FOR SALE: Embossing Machine for Plastic film, light or heavy gauge. Will Emboss, laminate & polish 8 preheating rolls, electric controlled, Teflon covered, 64" face, with dual let off and dual friction clutch take up, air guides & baloney roll. Can be seen in operation. T & M MACHINE & TOOL CO., 15-17 Greenpoint Ave., Brooklyn 22. New York, Tel.: EV 9-1944.

FOR SALE

32-ounce Lester Injection Molding Machine, new in 1950, in excellent operating condition, ready to deliver immediately. Can be seen in operation. Asking $22,000.00. Will consider offer after inspection for quick removal. STANLEY BERG & CO. Frick Building, Pittsburgh, Pa. Phone—EXpress 1-3535.

FOR SALE: 2—800 ton self-contained molding presses; 1 Wood 30 ton lab press; 1 Ball & Jewell #1 rotary cutter; 2 Cumberland #14 rotary choppers; 1 NRM 1" extruder; also mills, mixers, extruders, etc. CHEMICAL & PROCESS MACHY. CORP., 146-148 Grand St., New York, New York.

FOR SALE: Scott Tester, IP Serigraph, 110 volt, 60 cycle, single phase. Also NRM 1" bench extruder with Keystone Engineering boiler. All in excellent condition, only slightly used. Reply Box 1055, Modern Plastics.

FOR SALE: Imported extruders. Latest developments, self-contained. Moderately priced. For details write or call: ACME MACHINERY & MFG. CO. INC., 102 Grove Street, Worcester, Mass. Tel.: PLeasant 7-7747.

(*Continued on page 288*)

CLASSIFIED ADVERTISING

(Continued from page 286)

FOR SALE: INJECTION MACHINES: Impco VF-822 and VF-822A, 350 Tons Clamp. HPM Model 200-H-9, 9 oz., 200 Tons Clamp. HPM Model 350-H-16, 16 oz., 350 Tons Clamp. Reed-Prentice 12 oz., 1952 Machine. Reed-Prentice and Watson-Stillman 2 oz. Van Dorn Model H-200, 1 oz. (2) EXTRUDERS: 6" Royle #4, 6" Allen-Williams "Rapido." 3½" Hartig, 2" Royle #1, All Individual Motor Drive. HYDRAULIC PRESSES: Elmes 1000 Ton Hobbing Press, MD Pump. Baldwin-Southwark 3600 Ton Belt Press. HPM 750 Ton, Self-Contained. Lake Erie 215 Ton Self-Contained, Semi-Automatic. Watson-Stillman and HPM 100 Ton, Burroughs 75 Ton Electrically Heated, HPM 35 Ton Molding Presses. Watson-Stillman and Elmes 30 and 20 Ton Lab Presses. Stokes Model 200D-3 and Model 235 Automatic and 200 Ton, 150 Ton and 100 Ton Semi-Automatic Presses. TABLET MACHINES: Stokes S-5, R, T and RDS-3 and Colton #5 and #5½. SCRAP CUTTERS: Ball & Jewell Stainless Steel, 1 HP Motor. Cumberland #0, 2 HP. MILLS: 1—Kemco 26"x22"x60", 200 HP Motor and Speed Reducer. 4—Farrell 18"x50", 250 HP Speed Reducer. Available as a Mill Line or Individual Units. 4—Farrell 16"x40", 150 HP Motor and Speed Reducer. MIXERS: Banbury #1, Completely Chrome Plated Interior for Plastics, 50 HP Motor Drive Oil Heating System, All Controls. Baker-Perkins, Jacketed, 2¼ Gallons, Gear-Motor Drive. MISCELLANEOUS: Vulcanizers, Calenders, Grinders, Pumps, Valves, Platens, Etc. JOHNSON MACHINERY COMPANY, 683M Freilnghuysen Avenue, Newark 5, New Jersey. Bigelow 8-2500. WHAT HAVE YOU FOR SALE? WHAT ARE YOU LOOKING FOR?

MACHINERY and EQUIPMENT WANTED

WANTED: Resin Kettles, stainless steel or glass lined, from pilot plant up to 2000 gal. sizes. Also Rotary Pellet Presses; B & J cutters; Mikro Pulverizers; etc. Send us your list of surplus equipment. PERRY EQUIPMENT CORP., 1439 N. 6th St., Phila. 22, Pa.

WANTED: One 3-A Banbury. State price, condition, etc. Reply Box 1000, Modern Plastics.

DESIRE PURCHASE three used late type eight ounce and twelve ounce Lester injection machines. Reply Box 1028, Modern Plastics.

WANTED: Cumberland Model 1½" Granulator. Reply Box 1041, Modern Plastics.

MATERIALS FOR SALE

FOR SALE
5,000 lbs. Virgin Dow 475 Chartreuse, 30,000 lbs. Silver, 15,000 lbs. Red, 8,000 lbs. Green and Blue, 10,000 lbs. Yellow Reprocessed high impact Polystyrene. 28,000 lbs. A-1 Natural Reprocessed Polyethylene Pellets, Also 10,000 lbs. each, Red, Blue, Green, and Yellow. Samples and prices on request.
A. BAMBERGER CORPORATION
703 Bedford Ave., Brooklyn 6, N.Y.
MAin 5-7450

LENS: Clear Plastic Acetate, gov't spec M-1944 industrial goggles, 300,000 avail at 6¢ each. KROLL, 30 Irving Place, New York 3, New York.

FOR SALE: 125,000 pounds virgin phenolic mahogany molding material suitable for radio cabinets and large castings. Attractively discounted. Reply Box 1014, Modern Plastics.

FOR SALE: 20,000 lbs. each Red and Blue Styrene Pellets. Surplus lot Red Acetate Pellets—15,000 lbs. Both attractively priced. We are also in the market for all surplus plastic scrap and powder. PLASTIC MOLDING POWDERS, INC., 2004 MacDonald Avenue, Bklyn., N. Y. Tel.: ES 5-7942.

BRITISH FIRM of P.V.C. sheet manufacturers have approximately 50 tons of P.V.C. scrap for sale in various colours, excellent condition. Samples available on request, and stock can be inspected on site. Reply Box 1052, Modern Plastics.

FOR SALE: 1 ton Ebonite powder for disposal. Samples available on request. RIST'S WIRES & CABLES LTD., Lower Milehouse Lane, Newcastle, Staffs, England.

50,000 LBS. RIGID VINYL SHEET SCRAP: Clear, White & Assorted Colors. Lowest Prices. CLAUDE P. BAMBERGER, INC., 152 Centre Street, Brooklyn 31, New York. Tel.: Main 5-5553. Not connected with any other firm of similar name.

MATERIALS WANTED

WANTED: Plastics Scrap and Rejects of all kinds, ground and unground. Also rejected molded pieces and surplus virgin molding powders. Top prices paid.
A. BAMBERGER CORPORATION
703 Bedford Ave., Brooklyn 6, N. Y.
MAin 5-7450

CLEAR ACRYLIC MOLDING POWDER SCRAP wanted by end user either reground or unground. Also nylon molding powder scrap needed. Highest cash prices paid. Reply Box 1053, Modern Plastics.

SCRAP PLASTICS: All forms, waste and surplus plastic molding materials, rejects in any form. We will also buy your obsolete inventories of molding powders, stabilizers, plasticizers and other plastic and chemical materials. ACETO CHEMICAL CO., INC., 40-40A Lawrence St., Flushing 54, N. Y. INdependence 1-4100.

WANTED: PLASTIC SCRAP. Polyethylene, Polystyrene, Acetate, Acrylics, Butyrate, Nylon, Vinyl. GEORGE WOLOCH, INC., 601 West 26th Street, New York 1, N. Y.

WANTED: Plexiglas and Lucite scrap, salvage and cut-offs, any quantity. DUKE PLASTICS CORP., 584 Broadway, Brooklyn 6, N. Y. Tel.: EVergreen 8-5520. Note new address!

PLASTIC SCRAP WANTED
All Types of Molded Rejects
sheet trim, surplus inventories
and obsolete parts.
CLAUDE P. BAMBERGER, INC.
152 Centre Street, Brooklyn 31, New York
Tel.: Main 5-5553
Not connected with any other firm
of similar name.

MOLDS FOR SALE

FOR SALE OR EXPORT: Metal drape and vacuum forming shell molds of Xmas items for illuminated displays. Santas (all sizes), sleighs, candles, angels, reindeer, candy canes, bells, etc. All for half of original cost. Also many other molds in stock for novelties, etc. Reply Box 1005, Modern Plastics.

FOR SALE for EXPORT USE ONLY: One (1) Four (4) cavity Baby Brush Mold. Shot weight 135 grams. Horizontally gated. Price Six Hundred Dollars. Reply Box 1044, Modern Plastics.

FOR SALE: Nine plastic injection molds, four and six cavity frames and temples, also nine hundred gross pair lenses, approx. 25,000 frames, 50,000 temples, other misc. items, all sold one lot. KROLL, 30 Irving Place, New York 3, N.Y.

PLAQUE MOLD FOR SALE: Will sell a 14 cavity plaque mold, almost new, that produces assorted figures. Can be used to make various infant's items such as rattles, etc. Will sell cheap. Call JIFFY PRODUCTS, 205 Lexington Avenue, New York City. MU 4-5477.

MOLDS WANTED

MOLDS WANTED: Wish to purchase injection molds for various kitchen and household items. CENTRAL HOME PRODUCTS, INC., P.O. Box 703, Syracuse 1, New York.

MOLDS WANTED: Wanted for lease (not less than six months) or sale, molds for fully automatic injection-molding machines, 2 oz. to 4 oz. capacity, in toy, novelty, jewelry, or similar fields. Send samples and details to Box 1051, Modern Plastics.

PLANTS FOR SALE

FOR SALE
Complete wood flour mill. Capacity 10 tons per 24 hours, using nearby supply of pine and poplar. For further particulars, reply Box 1048, Modern Plastics

HELP WANTED

INJECTION MOULDING SALES MANAGER: Leading manufacturer in N.J. requires an experienced sales executive to manage their custom and proprietary injection moulding sales. Please send complete resume including experience, education and salary requirements. Reply Box 1016, Modern Plastics.

FIBER GLASS SALESMAN
AAA-1 manufacturer of plastic reinforcing materials requires experienced man to handle sales and technical service for Midwest territory with headquarters in Cleveland-Akron area. Resin, Fiber Glass, or Allied background and top contacts with molders and laminators desirable. Please submit resume to Personnel Mgr., of BIGELOW-SANFORD CARPET COMPANY, Glass Products Division, 140 Madison Avenue, New York 16, New York. Replies treated confidentially.

PLASTICS: Man with actual button experience in polyesters wanted to take charge of new factory. Salary and bonus. Reply Box 1006, Modern Plastics.

CASH-IN YOUR KNOW-HOW
Do you have the "know-how" to take complete charge of the designing and remodeling of thermal plastic film and paper converting machinery for a well diversified, progressive company? An engineering degree is immaterial IF you have sufficient practical experience. Ours is a fast expanding organization with the main office located in the suburbs of a fair-size mid-western city. We believe that this opening can be The Big Opportunity for the right man. Have an excellent profit sharing and stock purchase plan plus the usual employee benefits. If your letter convinces us you may be the man for the job, we'll arrange an interview at no expense to you. Please send photo or snapshot. Our people all know of this advertisement. Reply Box 1001, Modern Plastics.

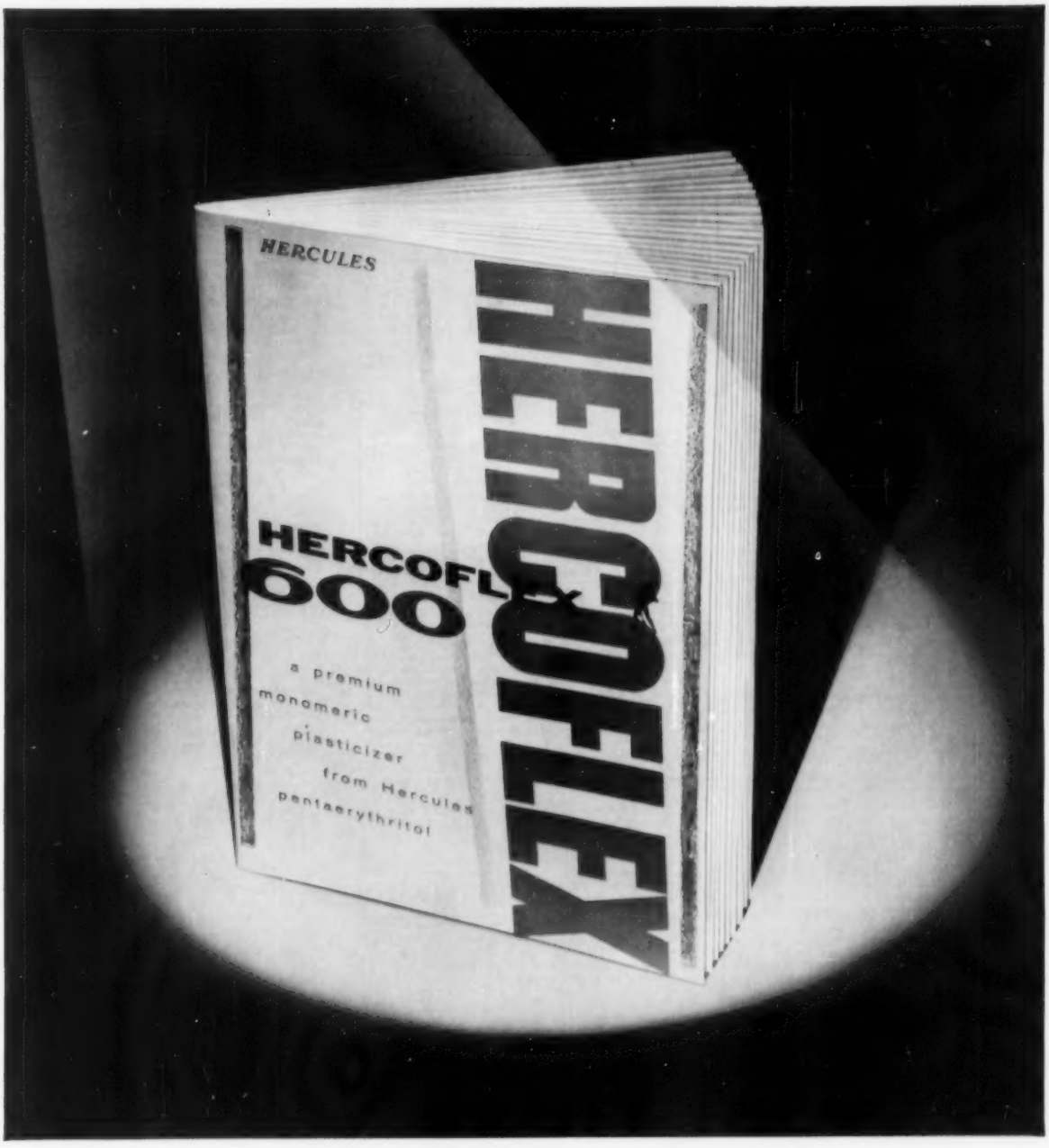
FINISHING SUPERVISOR: Experienced, to take charge of a rapidly expanding finishing department for a leading Midwest custom molding company. Knowledge of materials, masking, silk screening, hot stamping and vacuum plating of injection molded parts essential. Give previous experience and salary requirements. All replies in strict confidence. Reply Box 1011, Modern Plastics.

FACTORY MEN WITH KNOW HOW
Eastern plastics plant desirous of locating top factory men to take charge of new product development and production in fields in which they are familiar—Any and all phases of the plastics industry will be considered. Reply Box 1009, Modern Plastics.

CHEMICAL ENGINEER—CHEMIST: Plastics Evaluation—Application: Well established chemical manufacturer is planning to enter the high polymer field and has a vacancy for a man with 3 to 6 years experience in applications or evaluation in its research and development department. Age: 25-35, degree in chemistry or chemical engineering from recognized school. Please submit confidential resume in reply to Box 1015, Modern Plastics.

TOOL ROOM FOREMAN
Large midwest plastic injection molder requires Tool Room Foreman for ten man mold maintenance shop. Good background of experience required. Reply Box 1007, Modern Plastics.

(Continued on page 290)



IF YOU WANT UNUSUAL ELECTRICAL PROPERTIES in vinyl wire insulation, for instance, you should know more about this new plasticizer. If you don't already have a copy of this book, call your local district office representative, or write:

Synthetics Department

HERCULES POWDER COMPANY

INCORPORATED

916 Market St., Wilmington 99, Del.

CLASSIFIED ADVERTISING

(*Continued from page 288*)

COME TO TEXAS
We have permanent opportunities galore for injection molding plant personnel—plant engineer, assistant plant superintendent, foremen, machine operators, maintenance men, set-up men. Inquire about foreman training program. Our employees know about this ad.
LOMA PLASTICS, INC.
P. O. Box 11277
Fort Worth, Texas

FILM ENGINEER: Experienced Polyethylene Film Extrusion Engineer or Superintendent. Plant situated in Middle West. Excellent opportunity for permanent and profitable future. Reply Box 1030, Modern Plastics.

MOLD DESIGNER
Large injection plastic molder in midwest desires Mold Designer with primary experience in designing injection molds. Some assembly fixture work. Must have experience in this field. Reply Box 1008, Modern Plastics.

PLASTIC SALES ENGINEER: We are seeking a well qualified man experienced in plastics extrusion for attractive Market Development position. Kindly give your education, experience, and expected salary in complete resume. All replies will receive careful attention and will be held confidential. Write: 108 Personnel Department, Chemical Division, KOPPERS COMPANY, Pittsburgh 19, Pa.

RESEARCH ENGINEER:
Leading Eastern Paper Company has an opening for an outstanding Research Engineer. This engineer should be experienced in the field of plastic coatings and problems of extrusion. All degree levels will be considered. Send complete resume to B-47, P. O. Box 3575, Philadelphia 32, Pa.

CHEMIST: Experienced in compounding for extrusion and moulding of polyvinyl chloride. Midwest location. Must be familiar with production problems and techniques. Send complete resume and state salary requirements. Reply Box 1010, Modern Plastics.

DESIGN ENGINEERS
Several positions open for designers of injection, compression and reinforced plastic molding presses. Will consider men with general engineering experience. Excellent working conditions and opportunities for advancement. Contact R. J. Lindsey, Director of Engineering, THE HYDRAULIC PRESS MFG. CO., Mount Gilead, Ohio.

WANTED: Mature executive with experience in the vacuum forming of thermoplastic sheet. Established Ohio molder of reinforced plastics desires to enter this field. Reply Box 1020, Modern Plastics.

PLASTICS & FOAM CHEMIST
Position open with leading resin manufacturer in the research and development of polyester resins and foams. New air-conditioned research center in Pittsburgh area affords excellent advancement opportunities. State education and experience in first letter. All replies will be held in strict confidence.
Reply Box 1013, Modern Plastics.

TECHNICAL SALES PERSONNEL: Here is an opportunity to join our hard-hitting sales team at the beginning of another broad expansion of our sales efforts. We are seeking men with technical degrees, who have 2 to 4 years successful sales experience in either heavy industrial chemicals or thermoplastics. The men selected must have a keen desire to succeed in a technical sales career, and be willing to relocate and travel. In return we offer employment in which progress and future are a product of performance. In reply outline education, experience and approximate salary to: R. A. Long, Personnel Manager, SPENCER CHEMICAL COMPANY, 610 Dwight Building, Kansas City 5, Missouri.

CHEMIST OR CHEMICAL ENGINEER: Young man with 1 to 3 years' experience in PVC compounding, preferably in dispersion coatings. This is an opportunity with one of the largest processors of vinyl plastics. Write, stating education, experience, salary desired to H-53, P. O. Box 3495, Phila., 32, Pa.

RESIN AND PLASTIC SALESMAN desired by prime manufacturer of resins and injection molding compounds. Eastern territory, company automobile, all expenses paid, salary and bonus. Prior successful sales experience essential. Excellent opportunity. Reply Box 1021, Modern Plastics.

SALES REPRESENTATIVE: Knowledge of fatty acids and plasticizers and their uses helpful. Chemical education and sales experience necessary. Ohio and Mid-West Territory, travel includes some week-ends. Salary commensurate with experience and ability. Car furnished. Age to 35. Send full resume. Harchem Division, WALLACE & TIERNAN INC., 25 Main Street, Belleville, New Jersey.

VACUUM FORMING SPECIALIST
Required by a Cleveland Manufacturer entering the vacuum-forming field in displays, packaging, and especially industrial components. Must be capable of setting up a complete integrated operation, and of supervising and training personnel in all phases of tooling, forming and subsequent finishing operations. Above all, must have a high degree mechanical aptitude—an imagination of a practical nature. Submit a complete outline of your previous experience, education, age, and salary requirements.
Reply Box 1045, Modern Plastics.

WANTED: Injection molding engineer. Young, progressive, rapidly growing medium sized company in desirable Upstate New York locality, needs ambitious engineer to supervise, expand and coordinate injection molding activities plus projected vacuum forming projects; presently all in polyethylene. Tool design, machine shop follow-through and resin evaluation experience required. Send complete resume. Reply Box 1032, Modern Plastics.

SALESMAN
Manufacturers' Agent Representing Grade A Companies is looking for a salesman with experience in selling raw materials to producers of vinyl film, sheeting, rigids, etc. This is an excellent opportunity with an aggressive, growing sales organization which is willing to make the right man an attractive offer. Reply Box 1046, Modern Plastics.

HELP WANTED: A-1 Extrusion Man. Well rounded experience in profile extrusion and tubing of all thermoplastics. Must be capable of doing own set-up and die adjustment work. Excellent opportunity in well established progressive Michigan plastics plant. Reply Box 1042, Modern Plastics.

OPPORTUNITY FOR ARCHITECTURAL, STRUCTURAL, MECHANICAL AND CHEMICAL ENGINEERS
with Record of Ingenuity and Originality in Research and Development of quality Metal and Plastic Building Components. Very large, progressive manufacturer in middle western city, who is establishing a new general research and development division, solicits applications for employment from persons qualified by training and experience for this work. Send complete record of age, training, experience, employment and salary desired with first letter. All applications held strictly confidential and will be acknowledged promptly. Reply Box 1049, Modern Plastics.

WANTED: Superintendent to take full charge of small injection molding plant. Located in Central New England. Reply Box 1054, Modern Plastics.

SALESMAN
Wanted by manufacturer of fine Organic Dry Colors located in New Jersey. Must have well established contacts with color consuming trades such as plastics, paper coatings, textile inks, carbon paper, crayons, etc. Excellent opening for the right man. Send resume with details of education, experience, etc. Reply Box 1047, Modern Plastics.

SUBSTANTIAL INVESTMENT GROUP in East desirous of locating man who can initiate and take complete charge of a plastic scrap operation in return for an interest in the business and a good salary. Reply Box 1040, Modern Plastics.

SITUATIONS WANTED

PLASTICS AND RESIN CHEMISTS & ENGINEERS AVAILABLE on consulting basis. We can supply the technology and know-how not open to the small producer without a high priced technical staff at reasonable rates. Reply Box 1038, Modern Plastics.

DESIGNER with strong experience and education in ceramics would like to transfer ability to plastics field. Also have talent in related commercial design media. Not a white-collar designer; but resourceful, imaginative, cooperative, adaptable. Interested in good designs that sell. Age 35 yrs. Reply Box 1017, Modern Plastics.

REINFORCED PLASTICS ENGINEER: Seeking position with greater opportunities. M. A. degree Chemistry—age 28—married. Two years research experience. Several years sales service with large polyester resin manufacturer. Familiar in all phases of reinforced plastics including cost analysis, plant set-up, operations, production and purchasing. Some experience with rigid and flexible foams. Reply Box 1012, Modern Plastics.

PLASTICS ENGINEER: Age 32, 9 years experience in thermoplastics production and compounding. Chief chemist vinyl film plant three years. Plant manager plastic reprocessing plant two years with acetate, styrene, vinyl and polyethylene. Development engineer four years. Project experience includes vinyl sheeting, plastisol coating, film printing, and polyethylene and vinyl extrusion. Desire responsible position in manufacturing or technical service in the metropolitan New York area. Reply Box 1024, Modern Plastics.

CHEMICAL ENGINEER: B. Ch. E., age 32, seeks position in production or administration with thermoplastic process company. Technological experience in coloring, color matching, scrap reclaiming, compounding of thermoplastics on banbury and extruders, custom extruding, injection molding. Administrative background includes masters degree in Business Administration, and experience in production planning, production control, scheduling, purchasing, and supervising production. Reply Box 1033, Modern Plastics.

PROGRESSIVE EXECUTIVE: Age 35, formerly assistant to president large West Coast molder and laminator (treasurer and director). Industrial and consumer fields. Complete administrative experience in finance, production and sales provides an excellent background to assume a challenging managerial position or to assist a top executive in the execution of his duties. Now residing in N.Y.C. Full detailed references. Reply Box 1039, Modern Plastics.

REINFORCED PLASTICS: Can equip, staff and administer polyester-glass operation including preforming, matched die molding, vacuum rub-out, Marco method, hand lay-up, bag molding, premix compounding and molding. Pioneering experience epoxies. Presently technical director midwest molder. 15 years professional history. Degree in chemistry. Prefer Southwest location. Consider anywhere. Reply Box 1022, Modern Plastics.

REINFORCED PLASTICS ENGINEERING or management: B.S. (Chem. Engr.), M.S. (Mech. Engr.), age 37, 14 years diversified industrial experience: design, development, manufacturing and sales. Recognized reinforced plastics expert with a broad plastics background, a pleasing personality and ability to administer a complete organization. Desires responsible position in a progressive company where ability to produce results will be recognized. Reply Box 1036, Modern Plastics.

SALES ENGINEER—CUSTOM INJECTION MOLDING: Desires position with efficient, progressive molder. Young, aggressive, 16 years uninterrupted experience in the field. Substantial following among industrial and consumer accounts. Creative sales personality and sales promoter. Thorough knowledge all production problems. Plant to be located Greater New York area. Salary plus commission or drawing against commission. Reply Box 1027, Modern Plastics.

(*Continued on page 291*)

CLASSIFIED ADVERTISING

(Continued from page 290)

SALES AGENTS WANTED

MANUFACTURER of rigid plastic sheets seeks manufacturer's representative for new line of optically clear, Cast Acrylic Sheets. Position requires calls on distributors, fabricators and end users. Enterprising salesman can attain high earnings with product much in demand. Commission basis. Reply Box 1026, Modern Plastics.

SALES REPRESENTATIVE WANTED for an aggressive eastern firm who now serves many of the industrial firms in the packaging industry. Can do custom fabricating to specifications via electronic heat sealing and stitching. Can also handle large productions. Commission basis. Will offer protective territory to right man. Replies will be held strictly confidential. Reply Box 1002, Modern Plastics explaining experience and lines you now carry.

MANUFACTURERS REPRESENTATIVES wanted for Boston and Washington sales areas in all type plastic molding and die casting, large and small. JERSEY PLASTIC & DIE CASTING COMPANY, 149 Shaw Ave., Irvington 11, N.J. WAverly 6-1800.

MANUFACTURERS REPRESENTATIVES WANTED: Established custom compression and injection molding company in New Jersey seeks commission representatives with industrial contacts. Familiarity with molding processes desirable. Plant equipped for compression, plunger transfer, injection and automatic molding of thermosetting and thermoplastic materials. Most territories open. Reply Box 1023, Modern Plastics.

DOUBLE YOUR SALES VOLUME: Aggressive Plastics Manufacturer wants additional representatives now for custom Injection and Compression Molding. Many territories still available. A chance to double your income. ECONOMY PLASTICS MOLDING CO., 10 Esplanade Avenue, Pitman 13, New Jersey.

PLASTIC SALES REPRESENTATIVES: A large Eastern manufacturer seeks representatives to handle a complete line of extruded plastic products. All territories available. Send resume. Reply Box 1050, Modern Plastics.

MANUFACTURERS REPRESENTATIVES wanted by Eastern Polyethylene Specialists in extruding, printing, and converting of Polyethylene. Commission basis. Most territories open. Reply giving present lines and territory wanted to Box 1035, Modern Plastics.

MISCELLANEOUS

COMMISSION BASIS—Saint Louis, Mo.: Manufacturers' Representative, well financed, wants industrial plastics item line with good profit potential. Reply Box 1003, Modern Plastics.

BABY ITEMS: Wanted to buy, assemble and sell. We have nationwide distribution in this field. Reply Box 1034, Modern Plastics.

LULING, TEXAS
Population 6500
This South Texas City presents unusual opportunity for establishment of Plastics Manufacturing Plant. Conveniently located near raw materials and to fast growing trade area. Situated on three major highways and Southern Pacific Railroad. Attractive tax and utility rates. Good labor conditions. Good churches; schools and recreational facilities. Write
LULING CHAMBER OF COMMERCE,
Luling, Texas

ESTABLISHED compression molder desires to invest into small established injection or reinforced plastic plant willing to locate in N.J. All replies confidential. Reply Box 1019, Modern Plastics.

WANTED: Plastic charms, buttons and beads, miniature animals, etc. Send samples and prices in lots of 10M, 50M and 100M. ALLIANCE INDUSTRIES, P. O. Box No. 705, Alliance, Ohio.

HARD-HITTING, cost-minded, injection and compression molding specialist with 25 years experience in all phases of manufacturing and plant set-up desires to associate with existing small operation in need of experience or would be interested in setting up a new small operation on a partnership basis. I have modest capital and will gladly exchange financial and personal references. Available October 15th. Reply Box 1025, Modern Plastics.

All classified advertisements payable in advance of publication

Closing date: 28th of the second preceding month, e.g., Sept. 28th for Nov. issue.

Up to 60 words $10.00	Up to 120 words $20.00	Up to 180 words $30.00
Up to 60 words (boxed) $20.00	Up to 120 words (boxed) $40.00	Up to 180 words (boxed) $60.00

for further information address Classified Advertising Department,
Modern Plastics, 575 Madison Avenue, N. Y. 22, N. Y.

INDEX OF ADVERTISERS

OCTOBER, 1955

MODERN PLASTICS

575 MADISON AVENUE • NEW YORK 22, N.Y.

Chemicals you live by

You can depend on Diamond for PVC...

In packaging of DIAMOND PVC-45 *and* DIAMOND PVC-50, *as in their production, continuous control keynotes quality.*

Why do many processors today depend on DIAMOND for their polyvinyl chloride resins?

It is largely because the production of DIAMOND PVC-45 and DIAMOND PVC-50 is quality controlled. Every step—from raw materials to finished resins—is constantly checked and rechecked to assure consistently dependable, uniformly high quality products.

We'll be pleased to show you, too, how these dependable DIAMOND resins are especially adaptable to low-cost production of all types of flexible vinyl products. Write or call DIAMOND ALKALI COMPANY, Plastics Division, 300 Union Commerce Building, Cleveland 14, Ohio.

DIAMOND ALKALI CHEMICALS

Diamond Chemicals

In 1975, we'll still be Basic in Plasticizers

. . . AND YOU'LL STILL BENEFIT!

As a plastics manufacturer you already know the day-to-day benefits of buying plasticizers from a basic producer such as Pittsburgh: Complete quality control from coal to plasticizer . . . dependable uniformity of product . . . and prompt, reliable deliveries (perhaps even by helicopter tanker, as illustrated above, in future years!)

But perhaps you've overlooked this most important of all benefits our basic position offers you . . . and it concerns those *future* years. The development of our own raw material sources and plant equipment—from coke ovens to chemical plant—has been achieved over a period of many years, and by a considerable investment in capital and human effort. We have been building, and will continue to build for the future—in production capacity and in our constantly growing research program to provide you with better plasticizers at lower cost.

Don't *you* prefer to do business with a company you know will still be serving you well in 1975?

W&D 5780

PITTSBURGH *Job-Rated* PLASTICIZERS

PX-104 DiButyl Phthalate
PX-108 DilsoOctyl Phthalate
PX-114 Decyl Butyl Phthalate
PX-118 IsoOctyl Decyl Phthalate
PX-120 Dilso Decyl Phthalate
PX-138 DiOctyl Phthalate
PX-208 DilsoOctyl Adipate
PX-218 IsoOctyl Decyl Adipate
PX-220 Dilso Decyl Adipate
PX-238 DiOctyl Adipate
PX-404 DiButyl Sebacate
PX-438 DiOctyl Sebacate
PX-800 Epoxy
PX-917 TriCresyl Phosphate

PLASTICIZER DIVISION
PITTSBURGH
COKE & CHEMICAL CO.
Grant Building · Pittsburgh 19, Pa.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

CURES in seconds...

G.E.'s new 12900 Black & 12901 Brown general-purpose phenolic molding compounds

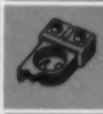
Among the fastest-curing and most versatile phenolic molding materials on the market today, General Electric's new high-density 12900 Black and 12901 Brown offer molders new opportunities to increase output, lower production costs, and mold high-quality, attractive parts to satisfy customer requirements.

CHECK THESE IMPORTANT PROPERTIES AND BENEFITS:

Fast cure—for more parts per press and lower production costs.

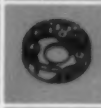
Good finish—for outstanding appearance of finished plastic parts.

Versatility—for both cold powder and preheat applications—a chance to minimize inventory requirements.



High apparent density, and good pourability—for faster production cycles and uniform pilling.

Good preheatability, over a wide temperature range—permitting more efficient utilization of presses and preheaters.



Rigid setting—for better dimensional stability and fewer rejects.

Low specific gravity—more molded parts per pound of compound.

Good machinability—for fewer rejects and lower production costs.

Low-erosion characteristics—to minimize mold abrasion, cut maintenance costs, reduce down time and finishing expenses.

Fluid melt with snap cure—for greater versatility in design and manufacture of even intricate parts.

For more information on fast-curing G-E 12900 and 12901, just write to General Electric Company, Section 521-5A, Chemical Materials Department, Pittsfield, Massachusetts.

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